North Carolina Department of Transportation
Office of Planning & Environmental
Statewide Planning Branch

THOROUGHFARE PLAN STUDY REPORT FOR THE

TOWN OF PLYMOUTH

FEBRUARY 2001

Thoroughfare Plan Study Report for the Town of Plymouth

Prepared by the: Statewide Planning Branch
Division of Highways
N. C. Department of Transportation

In Cooperation with: The Town of Plymouth
The Federal Highway Administration
U. S. Department of Transportation

February, 2001

Acknowledgments

Persons responsible for this report:

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Executive Summary

In December 1997, the Town of Plymouth recognized the importance of the process of planning for future transportation needs and requested thoroughfare planning assistance from the Statewide Planning Branch. The resulting Thoroughfare Plan for the Town of Plymouth, as shown in **Figure 2**, resulted from the implementation of the thoroughfare planning principles described in Chapter VIII of this report.

The Thoroughfare Plan study is based upon the traditional four-step modeling process: trip generation, trip distribution, mode choice, and trip assignment. This study involved two repetitions of this process. The first application required the collection of socio-economic data (employment and housing information), traffic count data, and geometric street data in the 1999 base year. Use of this data resulted in the simulation of a computer model representation of the existing Plymouth traffic patterns. The second application involved the projection of the socio-economic data and external station traffic volumes to the 2025 design year. The four-step process was applied to these projected data, thereby forecasting future traffic patterns for the planning area. A comparison of these traffic patterns to the existing roadway capacities identified anticipated roadway deficiencies for which various solutions were tested.

This report documents the findings of this study, along with the resulting recommendations for improvements. In addition, this report presents thoroughfare cross-section recommendations, cost estimates and benefit evaluations for the recommended improvements, and plan implementation recommendations.

After several informational meetings with the Planning Department, Town Council, and citizens of the planning area, the Town Council adopted the Plymouth Thoroughfare Plan at a public hearing held on October 16, 2000.

Initiative for plan implementation rests largely with the policy boards and citizens of the planning area. Highway needs throughout the State exceed the available funding; therefore, local areas should aggressively pursue funding for the projects they desire.

It is important to realize that the recommended thoroughfare plan is based upon anticipated growth and development of the planning area reflecting current zonal trends as provided by the Town of Plymouth. Prior to the construction of specific projects, a more detailed study will be required to reconsider development trends and determine specific design requirements.

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I. Introduction

An area's transportation system is its lifeline, contributing to its economic prosperity and social well being. The importance of a safe and efficient transportation infrastructure cannot be overstressed. This system provides a means of transporting people and goods from one place to another quickly, conveniently, and safely. A well planned system will meet the existing travel demands, as well as keep pace with the growth of the region. The Town of Plymouth recognized the importance of this process of planning for future transportation needs, and requested thoroughfare planning assistance from the Statewide Planning Branch of the North Carolina Department of Transportation (NCDOT) in December, 1997.

The Town of Plymouth is the county seat of Washington County, located in the eastern portion of North Carolina. Plymouth is located along the Roanoke River, approximately 70 miles west of Manteo, North Carolina. The geographical location of Plymouth is shown in **Figure 1**.

This report documents the development of the 2000 Thoroughfare Plan for the Town of Plymouth shown in **Figure 2**, which replaces the existing plan dated May 4, 1971 as presented in **Figure 3**. In addition, this report presents thoroughfare cross-section recommendations; cost estimates, purpose, and need for the recommended improvements; and plan implementation recommendations. A thoroughfare plan is developed to ensure that the transportation system will be progressively developed, meeting the needs of the Plymouth Planning Area. The thoroughfare plan will serve as an official guide to providing a well coordinated, efficient, and economical major street system. It will be utilized by local officials to ensure that planned transportation facilities will reflect the needs of the public, while minimizing disruption to local residents, businesses, and the environment.

The purpose of this study was to examine present and future transportation needs of the Plymouth area and develop an updated thoroughfare plan. The proposed system of thoroughfares was developed following the basic principles of thoroughfare planning as described in Chapter VIII of this report. The plan recommends those improvements which are necessary to provide an efficient transportation system within the 1999-2025 planning period. The recommended cross-sections for these improvements are based on existing conditions and projected traffic volumes, and are outlined in **Appendix F**.

Initiative for the implementation of the Thoroughfare Plan rests predominately with the policy boards and citizens of the Plymouth area. The Town of Plymouth and the North Carolina Division of Highways share the responsibility for proposed construction; however, highway needs throughout the state exceed available funding. Therefore, it is imperative that the local area aggressively pursues funding for desired projects.

The proposed thoroughfare plan is based on the anticipated growth of Plymouth and the surrounding area. It is possible that actual growth patterns will differ from those logically anticipated. As a result, it may be necessary to accelerate or retard the development of some thoroughfares found on the plan. Likewise, some portions of the thoroughfare plan may require revisions in order to accommodate unexpected changes in urban development.

GEOGRAPHIC LOCATION

FOR THE

TOWN OF PLYMOUTH

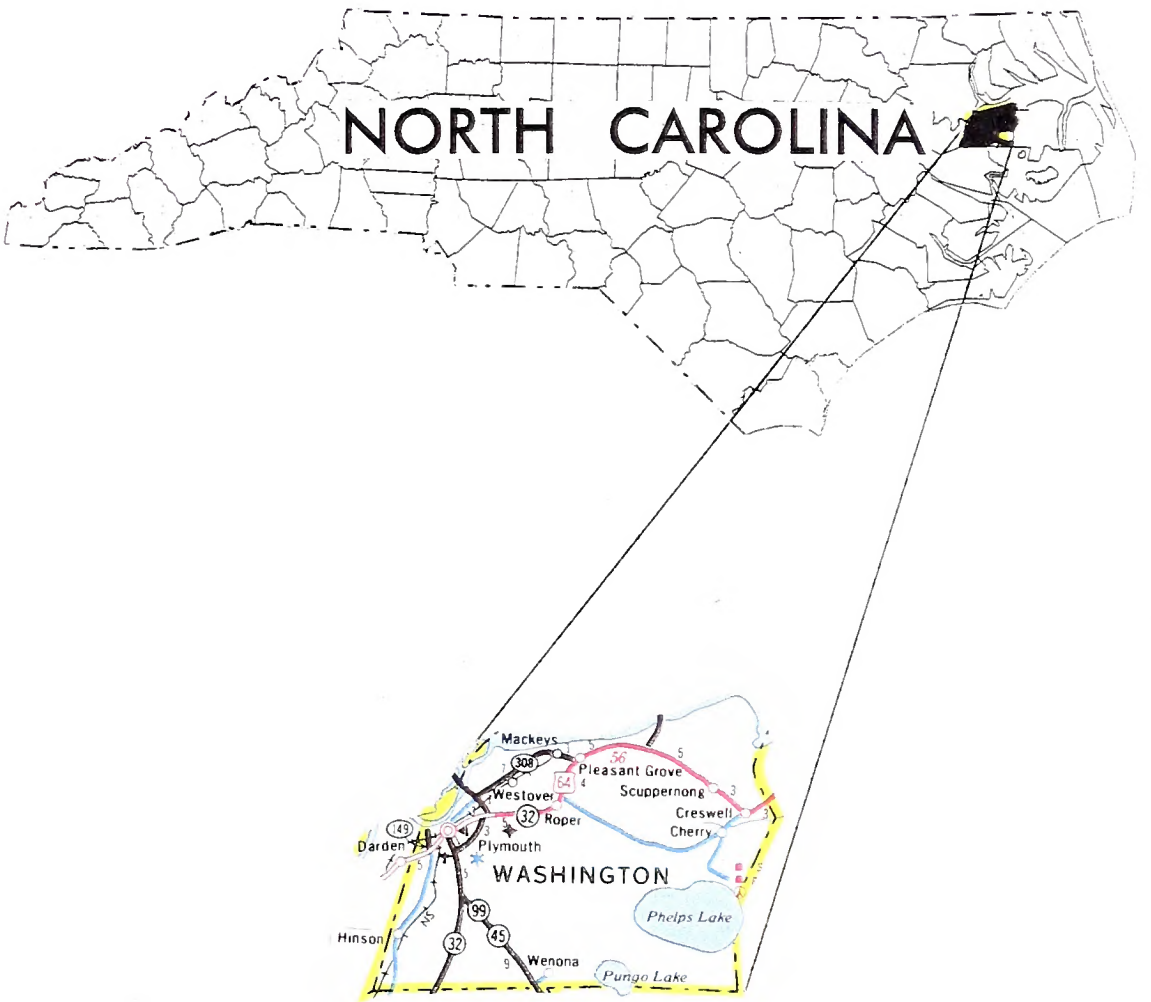


FIGURE 1

THOROUGHFARE PLAN

LEGEND

	EXISTING	PROPOSED
MAJOR	———	▪▪▪▪▪▪
MINOR	———	▪▪▪▪▪▪

ADOPTED BY:

TOWN OF PLYMOUTH — OCTOBER 10, 2000

Recommended Approval BY STATEWIDE PLANNING BRANCH — NOVEMBER 3, 2000

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION — DECEMBER 1, 2000

FIGURE 2

SEPTEMBER 11, 2000

PLYMOUTH

WASHINGTON COUNTY
NORTH CAROLINA

PREPARED BY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scale

0 600 1200 2400 3600 4800 6000

feet

Base Map Date
May 17, 2000

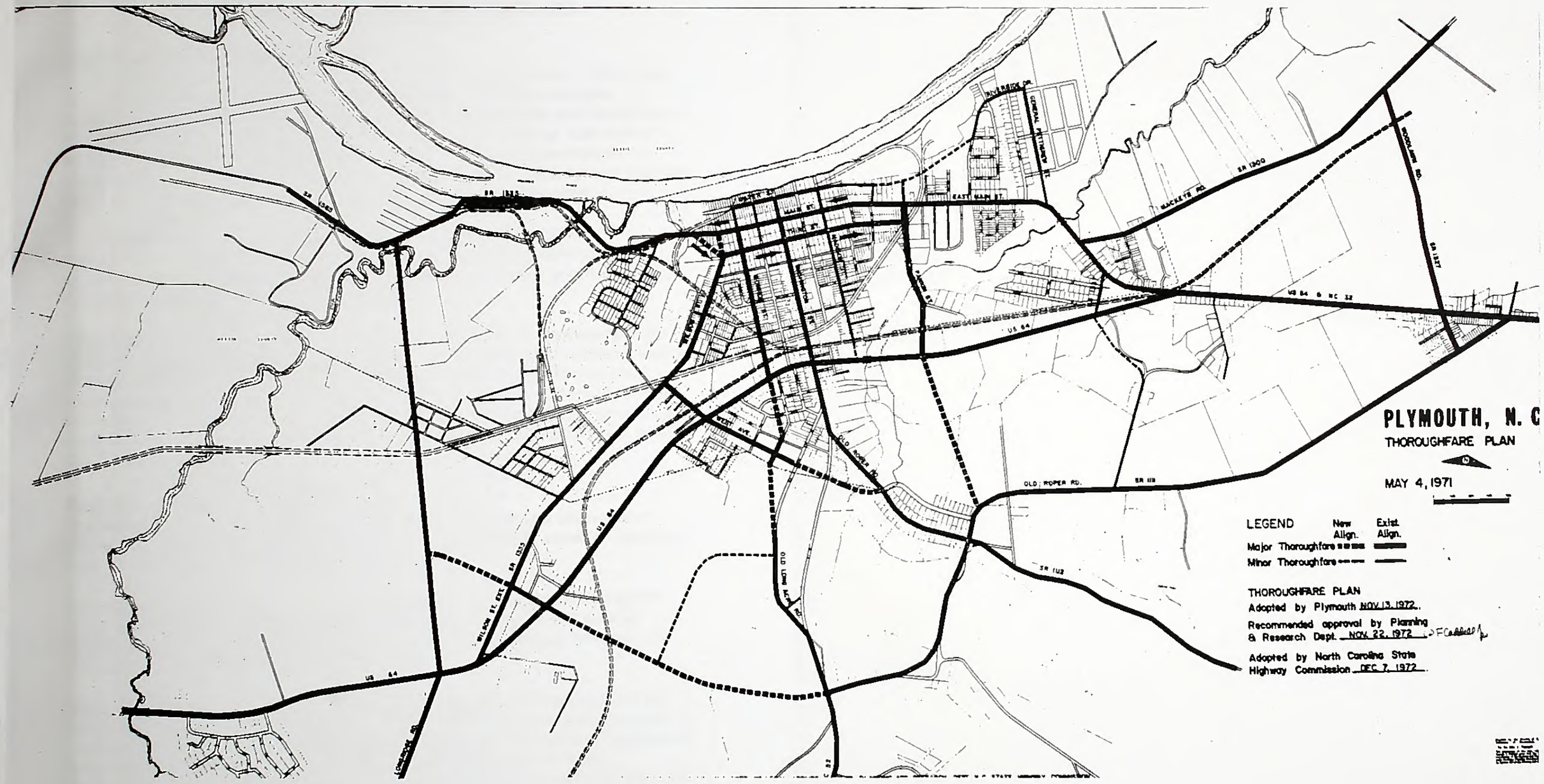


Figure 3
1971 Thoroughfare Plan

II. Thoroughfare Plan for Plymouth

Intent of the Thoroughfare Plan

Transportation is a major factor affecting a region's economic vitality. Without an adequate transportation system, people cannot easily reach their intended destination, goods cannot be delivered in a cost effective manner, and developers may look to invest in better served regions. Recent trends such as "just-in-time" delivery, increased automobile ownership, and increased migration away from central cities and towns are exhausting existing transportation systems and requiring that more emphasis be placed on planning now for future development.

A thoroughfare plan study identifies existing and future deficiencies in a transportation system, and examines the need for improvements and/or new facilities. A thoroughfare plan outlines the transportation network according to the functional use of each roadway within the system.

This chapter presents recommendations based on the ability of the existing street system to serve existing and anticipated travel desires as the area continues to grow. The recommended plan presents a system of freeways and major and minor thoroughfares to serve the anticipated traffic and land development needs for the Plymouth area. The primary objective of this plan is to reduce traffic congestion and improve safety through the elimination of existing and projected deficiencies in the transportation system.

Recommended Thoroughfare Plan

The recommended thoroughfare plan for the Town of Plymouth is presented in **Figure 2**. A thoroughfare plan is comprised of major roadways within the planning area, stratified into the following three classifications:

Interstates/Freeways, which carry high volumes of traffic within and through an area. These facilities are characterized by controlled access; access to other facilities is provided only at interchanges. No existing interstates or freeways are located within the Plymouth planning area.

Major Thoroughfares, which carry high volumes of traffic within and through an urban area. Access along these facilities varies from limited access to no control of access. Access to these roads should be provided by use of minor thoroughfares or local streets wherever possible. Generally, the majority of trips on major thoroughfares are internal trips, beginning and ending within the planning area. US 64 is an example of a major thoroughfare traversing the Plymouth planning area.

Minor Thoroughfares, which collect traffic from local access streets and carry it to major thoroughfares. Water Street is an example of a minor thoroughfare in the Plymouth planning area.

Recommended Improvements

The process of determining and evaluating recommendations for those roads comprising the thoroughfare plan involves many considerations, including the goals and objectives of the area, existing roadway properties, identified roadway deficiencies, environmental impacts, and existing and anticipated land development. Consideration of these factors led to the cooperative development of several recommended improvements, which are indicated by the dashed lines in **Figure 2**. The purpose and need for the significant recommendations are given below.

NC 45 Realignment

- **Project Recommendation:** It is recommended to realign NC 45 between Dismal Loop Road (SR 1181) and NC 32 to provide a four-way intersection with Long Ridge Road (SR 1106). The estimated cost of these improvements is $400,000.
- **Transportation Demand:** Currently, NC 45 is a major thoroughfare serving the southeastern portion of the Plymouth area. The realignment of NC 45 would provide a continuous route between the southern and western sections of Plymouth, thereby alleviating congestion at the intersection of Washington Street and US 64.
- **Safety Issues:** The recommended improvements for NC 45 should improve safety to motorists utilizing both NC 45 and NC 32. These improvements will reduce the number of turns by permitting a through movement on NC 45 and will reduce the number of intersections along NC 32.
- **System Linkage:** By providing continuity between NC 45 and Long Ridge Road (SR 1106), the recommended improvements are anticipated to function as a southern bypass of the US 64 corridor.

Rankin Street Southern Extension

- **Project Recommendation:** It is recommended to extend existing Rankin Street southward to NC 45. The estimated cost of these improvements is $2,000,000.
- **Transportation Demand:** Currently, Rankin Street provides a vital connection between downtown Plymouth and the US 64 corridor. Extending the roadway to NC 45 will provide a connection between the southeastern planning area and downtown and will also help to alleviate congestion at the Water Street intersection with US 64.
- **System Linkage:** The recommended roadway will function as connector between the southeastern and northern portions of the planning area.

III. Implementation

Implementation is a critical aspect of the thoroughfare planning process. If the recommendations of the plan are not actively pursued, the effort and expense associated with the development of the plan are wasted. Neglect of the implementation process is a three-fold loss: the loss of the capital expenditures used to develop the plan; the opportunity cost of the capital expenditures; and the loss of the benefits which would accrue from an improved transportation system.

There are several administration controls and implementation tools that will aid the implementation of the thoroughfare plan. These are generally mandated through Federal and State legislation, and include the following: Mutual Adoption of the Thoroughfare Plan; Subdivision Regulations; Roadway Corridor Official Map; Zoning Ordinances; Urban Renewal; Capital Improvements Program; and Development Reviews.

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a Thoroughfare Plan, the Plan may be adopted by the governing body of the municipality and the Department of Transportation to serve as the basis for future street and highway improvements.

In general, facilities which serve through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality are designated a State responsibility. Traditionally, these facilities have been constructed and maintained by the Division of Highways and Municipalities have been allowed to share in the right-of-way costs. Recently passed state legislation (G.S. 136-66.3) authorizes municipalities to voluntarily participate in the right-of-way and construction costs of State highway improvements located within the municipality or its extraterritorial jurisdiction. Meanwhile, those facilities which primarily serve internal travel are designated a municipal responsibility and shall be constructed and maintained solely by the municipality.

Administrative controls and implementation methods that can aid in the implementation process are generally available to municipalities through Federal and State legislation. These include, but are not limited to, subdivision regulations, zoning ordinances, official maps, urban renewal, capital improvement programs, and development reviews. Generally, available finances and citizen involvement play a major role in the implementation process; effective use of the aforementioned controls and methods can help to maximize expenditure of funds and minimize negative citizen reaction to specific elements of the plan.

Subdivision Regulations

Subdivision regulations are locally adopted laws that govern how a developer may divide land into building sites. Each developer is required to submit a plat of the proposed subdivision to the municipality for approval before a building permit will be issued. These regulations offer the municipality the best tool for implementing the thoroughfare plan. Through this process, it is possible to reserve or protect the necessary right-of-way for streets that are a part of the thoroughfare plan and to require subdivision streets to conform to the plan. The construction of subdivision streets to adequate standards will reduce maintenance costs and facilitate the transfer of the streets to the State Highway System. **Appendix D** outlines the recommended subdivision design standards as they pertain to road construction.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." The roadway corridor official map, more commonly referred to as an official street map, is a document adopted by the legislative body of the community that pinpoints and preserves the location of proposed streets against encroachment. In effect, the official map serves notice on developers that the State or municipality intends to acquire certain specific property. The official map serves as a positive influence for sound development by reserving sites for public improvements in anticipation of actual need.

The NCDOT limits its use of official maps to large scale, fully controlled access facilities planned for developing areas outside of municipal jurisdictions. For projects within municipal jurisdictions, official maps should be prepared and adopted by the local government.

For cities contemplating the adoption of a Roadway Corridor Official Map, more commonly referred to as an Official Street Map, there are several issues to consider. First and foremost, it should be recognized that an Official Street Map designation places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition of the issuance of building permits on subdivision property lying within an Official Street Map corridor for a period of up to three years, commencing with the development approval request. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The Program Development Branch of the North Carolina Department of Transportation administers the adoption of Roadway Official Corridor Maps. Municipalities considering Official Street Map projects should contact this branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps." Contact information for this branch is included in **Appendix G**.

Zoning Ordinances

Zoning ordinances complement thoroughfare planning by designating appropriate locations of various land uses and allowable densities of residential development. This provides a degree of stability on which to project future traffic and plan streets and highways. Other benefits of a good zoning ordinance include the establishment of standards of development that will aid traffic operations on major thoroughfares and the minimization of strip commercial development, which creates traffic friction and increases the traffic accident potential.

Urban and Community Revitalization

Urban and community revitalization helps to rehabilitate historic city and town centers, downtowns and neighborhoods, by renovating and rehabilitating existing structures in accordance with comprehensive community plans. This process may allow for corrections and improvements to street system layout and design. Efforts should be made to ensure that transportation plans are compatible with overall community improvement and downtown revitalization strategies.

The Community Planning Program of the Division of Community Assistance employs planners who are available to assist counties and municipalities with the following assistance areas: downtown revitalization, historic preservation, neighborhood conservation, strategic planning, growth management, main street program assistance, community appearance, land use planning and economic development. Regional office staff also assists communities and counties through interlocal and regional approaches to community economic development and growth management. Contact information for this department is included in **Appendix G.**

Capital Improvements Program

One of the tools that makes it easier to build a planned thoroughfare system is a Capital Improvements Program. This is a long range budget for street improvements, acquisition of right-of-way, and other capital improvements on the basis of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated a Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed and approved by the District Engineer's office of the North Carolina Department of Transportation. Any development expected to generate large volumes of traffic may be comprehensively studied by staff from the Traffic Engineering & Safety Systems, Statewide Planning, and Roadway Design Branches of NCDOT. If completed at an early stage, the development's accessibility may be significantly improved at minimal expense. Since the municipality is the first point of contact for the developer, it is important that the municipality advises them of this review requirement and cooperates in the review process. Contact information for the District Engineer's office responsible for the Plymouth area is included in **Appendix G.**

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements (for a capital improvements program).

3. Work with NCDOT to have local projects included in the Transportation Improvement Program (TIP). North Carolina's TIP is a document which lists all major construction projects planned by the NCDOT for the next seven years. Similar to local Capital Improvement Program Projects, TIP Projects are matched with projected funding sources. With each biennial update of the TIP, completed projects are removed, programmed projects are advanced, and new projects are added. Municipalities have the opportunity to request projects during the TIP public hearings held during the development process. Contact information for the TIP Unit of the Program Development Branch is included in **Appendix B**.

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvement (using subdivision regulations or facility fees discussed earlier).

6. Request Industrial Access Funds. If an industry wished to develop property that does have access to a state maintained roadway and certain economic conditions are met, the funds may be available for construction of an access road. Inquiries regarding these funds should be directed to the NCDOT Secondary Roads Office. Contact information for the Secondary Roads Office is included in **Appendix G**.

7. Request Small Urban Funds. Small Urban Funds are annual discretionary funds distributed to municipalities with qualifying projects, with a maximum $300,000 awarded per project per year. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation Member and Division Engineer. Contact information for these individuals responsible for the Plymouth area is included in **Appendix G**.

IV. Travel Deficiency Analysis of Existing System

An important stage in the development of a thoroughfare plan is the analysis of the existing street system and its ability to serve the area's travel desires. Emphasis is placed not only on detecting the existing deficiencies, but also on understanding the causes of these deficiencies. Travel deficiencies may be localized, resulting from problems with roadway design or intersection geometry. Travel deficiencies may also result from system problems, such as the need to construct missing travel links, bypass routes, loop facilities, or additional radial routes.

An analysis of the roadway system looks at both current and future travel patterns and identifies existing and anticipated deficiencies. This is usually accomplished through a traffic collision analysis, roadway capacity deficiency analysis, and system deficiency analysis.

Traffic Collision Analysis

Traffic collisions or "crashes" are often used as an indicator for locating congestion problems. While often the result of drivers or vehicle performance, crashes may also be a result of the physical characteristics of the roadway. Roadway conditions and obstructions, traffic conditions, and weather may all lead to a crash. While some crashes are the fault of the driver, others may be prevented with physical design changes or traffic control changes such as the installation of stop signs or traffic signals.

Crash data for the period from January 1995 to December 1997 was studied as part of the development of this report. The collision analysis considered both collision frequency and severity. Crash frequency is the total number of reported collisions, while crash severity is the crash rate based upon injuries and property damage incurred. These two factors helped to determine the worst intersections within the Plymouth planning area as shown in **Figure 4** and summarized in **Table 1.**

Table 1. Intersections of Concern Within the Planning Area*

Map Index	Intersection	Average Severity	Total Collisions
1	US 64 at NC 32 (Washington Street)	<10.00	13
2	US 64 at Rankin Street	13.76	10
3	US 64 at Main Street	<10.00	6
4	US 64 at Monroe Street	<10.00	6
5	US 64 at NC 149	<10.00	5
6	Monroe Street at Third Street	<10.00	5

*Collisions compiled for the January 1995 - December 1997 period, based upon those intersections having 5 or more reported accidents.

The NCDOT Division is actively involved with investigating and improving many of these locations. To request a more detailed analysis for any of the locations listed in **Table 1**, or other intersections of concern, the Town should contact the Division

Traffic Engineer. Contact information for the Division Traffic Engineer is included in **Appendix G**.

Roadway Capacity Deficiencies

Roadway capacity deficiencies occur wherever the travel demand volume of a roadway is close to or more than the capacity of that roadway. Travel demand volume is the total number of vehicles that wish to use a roadway on a daily basis. The existing travel demand volumes for the planning area are based upon traffic count data taken by the NCDOT Traffic Surveys Unit in 1999 and are shown in **Figure 5**. The projected 2025 travel demand volumes, which are based upon historic and anticipated population, economic growth patterns, and land use trends, are shown in **Figure 6**.

Capacity is the maximum number of vehicles that can pass over a given section of roadway during a given time period under prevailing roadway and traffic conditions while still maintaining a service level that is acceptable to drivers. Many factors contribute to the capacity of a roadway, including:

- Geometry of the road, including number of lanes, horizontal and vertical alignment, and proximity of perceived obstructions to safe travel along the road;
- Typical users of the road, such as commuters, recreational travelers, and truck traffic;
- Access control, including streets and driveways, or lack thereof, along the roadway;
- Development of the road, including residential, commercial, and industrial developments;
- Number of traffic signals along the route;
- Peaking characteristics of the traffic on the road;
- Characteristics of side-roads feeding into the road; and
- Directional split of traffic or the percentages of vehicles traveling in each direction along a road at any given time.

The relationship of travel demand volume to roadway capacity determines the level-of-service (LOS) of a roadway. Six distinct levels-of-service are possible, with letter designations ranging from LOS A, which represents the best operating conditions, to LOS F, which represents the worst operating conditions. LOS D indicates "practical capacity" of a roadway, or the capacity at which the public begins to express dissatisfaction. The six levels of service are illustrated in **Figure 7**.

Design requirements for thoroughfares vary according to the desired capacity and level-of-service. Recommended improvements and overall design of the Thoroughfare Plan were based upon achieving a minimum LOS D on existing facilities and a LOS C on new facilities.

1999 Traffic Capacity Analysis

The roadways in the Plymouth Planning Area were analyzed for existing capacity deficiencies. Based upon the traffic counts taken in January 1999, all roadways are currently operating well below capacity. However, peak periods, such as morning and afternoon peak hours or summer tourist peaks, may result in capacity deficiencies, particularly along US 64.

2025 Traffic Capacity Analysis

The capacity deficiency analysis for the 2025 design year is based upon the "no build" alternative. This analysis examined the existing street system and determined that the majority of existing facilities will be operating at acceptable levels in the design year. As in the 1999 analysis, peak periods, such as morning and afternoon peak hours or summer tourist peaks, may result in capacity deficiencies, particularly along US 64. Furthermore, the only major route that provides access from US 64 and the downtown area to the southern area of the planning boundary is NC 32. As a result, the intersection of US 64 and NC 32 will operate at an unacceptable level of service by 2025. This problem can be remedied with the implementation of the improvements recommended in Chapter II.

Bridge Conditions

Bridges are an important element of a highway system. Any bridge deficiency will affect the efficiency of the entire transportation system. In addition, bridges present the greatest opportunity of all potential highway failures for disruption of community welfare and loss of life. Therefore, bridges must be constructed to the same, or higher, design standards as the system of which they are a part, and must be inspected regularly to ensure the safety of the traveling public.

The NCDOT Bridge Maintenance Unit inspects all bridges in North Carolina at least once every two years. A sufficiency rating for each bridge is calculated and establishes the eligibility and priority for replacement. Bridges having the highest priority are replaced as Federal and State funds become available.

A bridge is considered deficient if it is either Structurally Deficient or Functionally Obsolete. A bridge is considered structurally deficient if it is in relatively poor condition or has insufficient load-carry capacity, due to either the original design or to deterioration. The bridge is considered to be functionally obsolete if it is narrow, has inadequate under-clearances, has insufficient load-carrying capacity, is poorly aligned with the roadway, and can no longer adequately serve existing traffic. A bridge must be classified as deficient in order to qualify for Federal replacement funds. Deficient bridges within the planning area are given in **Table 2**; the location of these bridges is shown in **Figure 4**.

Table 2. Structurally Deficient & Functionally Obsolete Bridges Located within the Planning Area				
Bridge Number	Location	Sufficiency Rating	Year Built	Remaining Life
9	NC 45 over Conaby Creek	50.2	1967	18
66	SR 1325 over Welch Creek	4.0	1937	2

BRIDGE DEFICIENCIES
AND
INTERSECTIONS OF CONCERN
LOCATIONS

LEGEND

Intersections having 5 or more reported collisions from January 1995 - December 1997

Structurally deficient/functionally obsolete bridge

FIGURE 4

PLYMOUTH

WASHINGTON COUNTY
NORTH CAROLINA

PREPARED BY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scale
0 600 1200 2400 3600 4800 6000
feet

Base Map Date
May 17, 2000

EXISTING TRAFFIC
AND
PRACTICAL CAPACITIES
1999

LEGEND

AVERAGE DAILY TRAFFIC — XXXXX

ROADWAY PRACTICAL CAPACITY — XXXXX

5000 / 12000
6000 / 12000
1540 / 9500
3900 / 12000
1700 / 9500
2300 / 9500
150 / 13500
2700 / 13500
9500 / 29000
1500 / 13500
400 / 9500
14000 / 29000
1600 / 11500
3100 / 12000
2400 / 10500
2000 / 10500
600 / 8500
1400 / 12500
5100 / 13500
3600 / 11500
8400 / 29000
700 / 11500
1900 / 11500

ROANOKE RIVER

FIGURE 5

PLYMOUTH

WASHINGTON COUNTY
NORTH CAROLINA

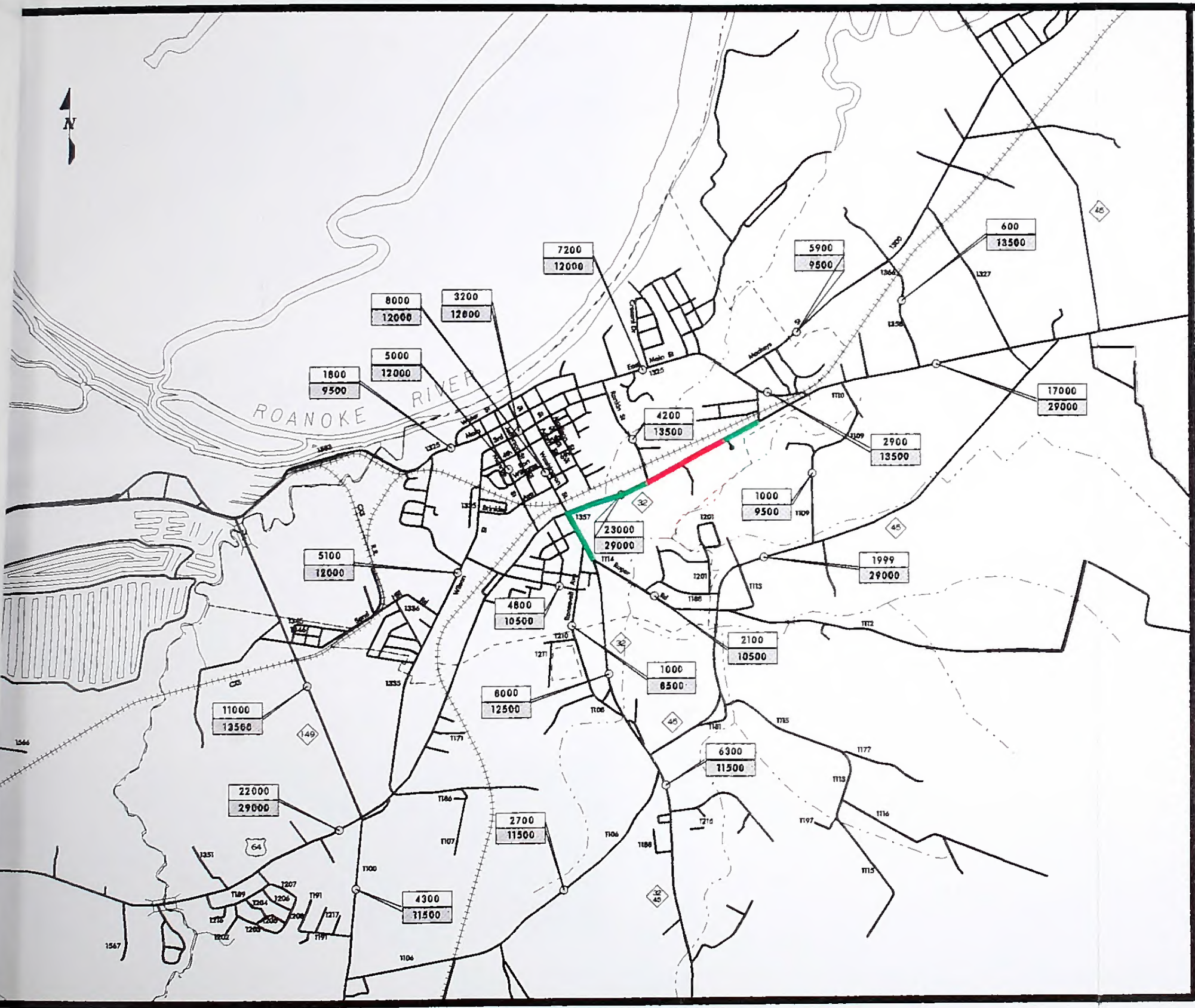
PREPARED BY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scale
0 600 1200 2400 3600 4800 6000
feet

Base Map Date
May 17, 2000

PROJECTED TRAFFIC AND CAPACITY DEFICIENCIES 2025



LEGEND

PROJECTED DAILY TRAFFIC XXXXX

ROADWAY PRACTICAL CAPACITY XXXXX

VOLUME TO CAPACITY RATIO:

0.8 < V/C < 1.0

≥ 1.0

FIGURE 6

PLYMOUTH

WASHINGTON COUNTY
NORTH CAROLINA

PREPARED BY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

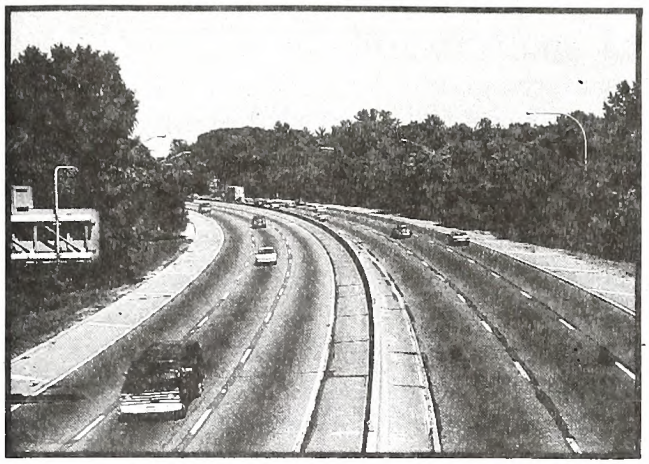
scale

0 600 1200 2400 3600 4800 6000

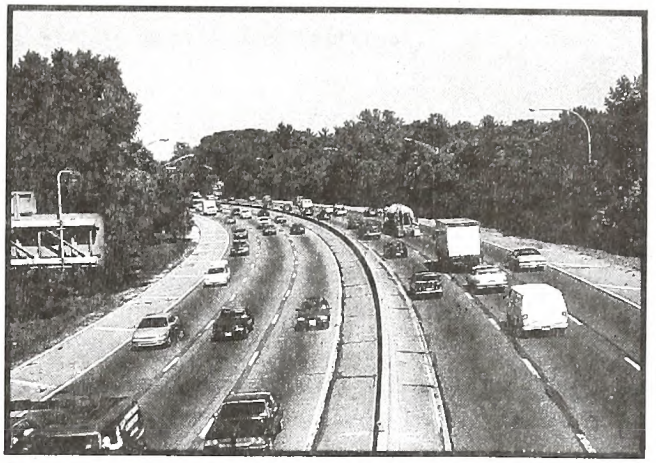
feet

Base Map Date
May 17, 2000

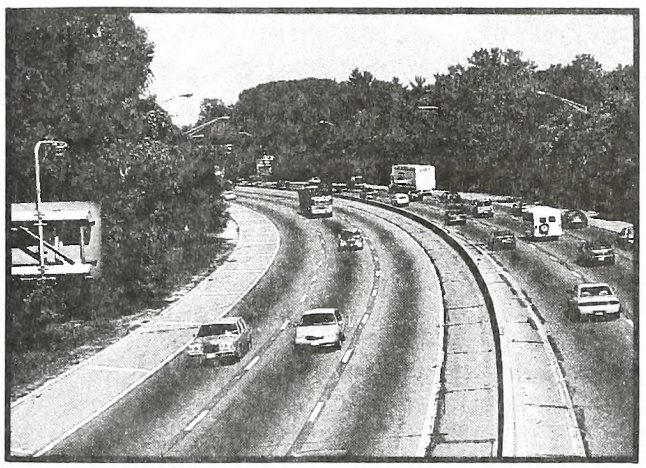
Source: 1994 Highway Capacity Manual



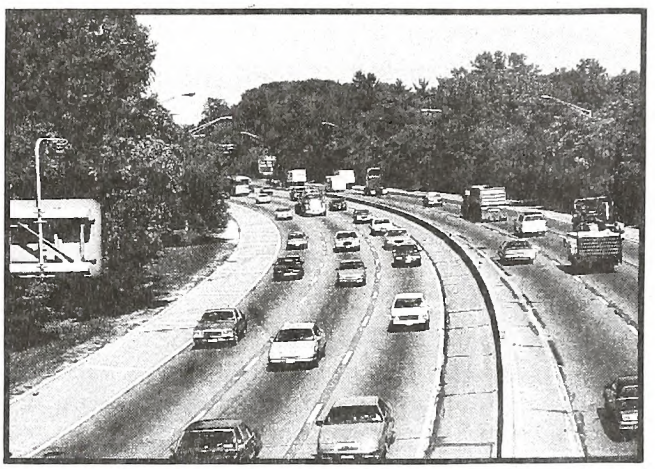
LOS A.



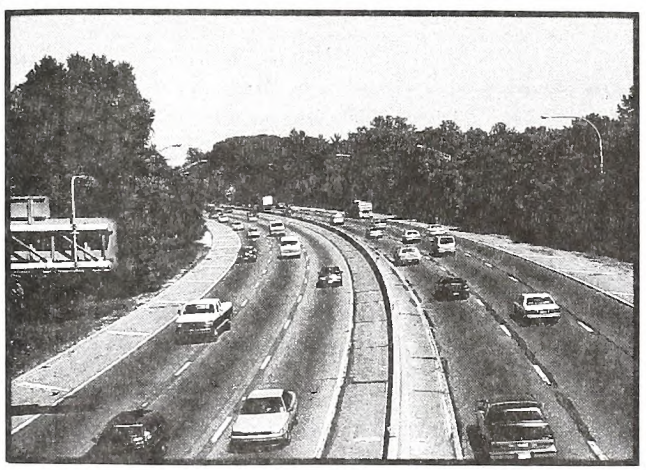
LOS D.



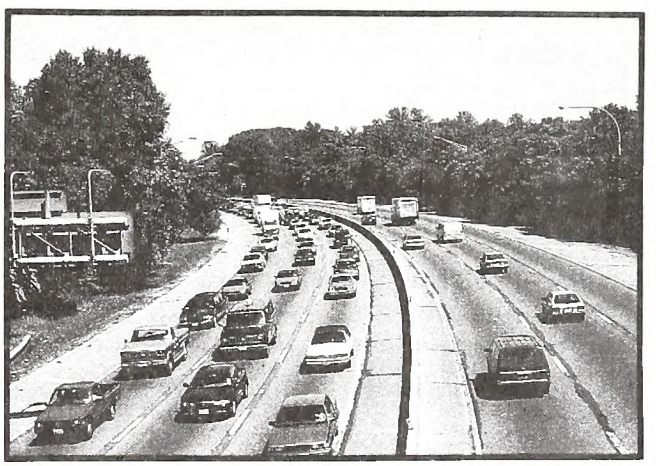
LOS B.



LOS E.



LOS C.



LOS F.

FIGURE 7

LEVELS OF SERVICE

V. Population, Land Use, And Economy

In order to fulfill the objectives of an adequate twenty-five year thoroughfare plan, reliable forecasts of future travel patterns must be achieved. Such forecasts depend on careful analysis of the following items: historic and potential population and employment changes; significant economic trends; character and intensity of land development; and the ability of the existing transportation system to meet existing and future travel demand. Secondary items that influence forecasts include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the urban area.

Population

Since the volume of traffic on a roadway is related to the size and distribution of the population that it serves, population data is used to aid the development of the thoroughfare plan. A survey of housing and employment information was conducted in order to determine the 1999 socioeconomic data required for traffic analysis of the planning area. The planning area population was determined by applying an occupancy factor to the actual number of counted dwelling units. **Figure 8** presents a graph of occupancy rates for both Washington and the Town of Plymouth since 1970. The base year occupancy rate of 2.60 persons per dwelling unit and 2,490 dwelling units established from the survey resulted in a base year planning area population of 6,474 persons.

The future year projections were determined for the 2025 design year. While statistics show that the population within Washington County and the Town of Plymouth has been decreasing since the late 1970's, local officials feel that population will increase over the planning period due to recent and planned developmental trends. Therefore, the population was projected based upon an expected 2% growth rate, yielding a planning area population of approximately 11,000 persons in 2025. This was then converted to dwelling units using occupancy rates projected from the 2.60 persons per dwelling unit established for the base year. The occupancy rate was determined to be 2.45 persons per dwelling unit for the 2025 design year, resulting in 4,460 dwelling units in the design year. A summary of dwelling units is included in **Appendix A**.

Land Use

Land use refers to the physical patterns of activities and functions within an area. The traffic of a particular road is related to the land uses adjacent to that facility. For example, a shopping center generates larger traffic volumes than a residential area. The attraction between different land uses and their association with travel varies with the size, type, intensity, and spatial separation of each land use. When dealing with transportation planning and for the purpose of travel demand modeling, land use is divided into the following classifications:

Residential
All land is devoted to the housing of people, with the exception of hotels and motels.

Commercial
All land is devoted to retail trade including consumer and business services and their offices; this may be further stratified into retail and special retail classifications. Special retail would include high-traffic establishments, such as fast-food restaurants and service stations; all other commercial establishments would be considered retail.

Industrial
All land is devoted to the manufacturing, storage, warehousing, and transportation of products.

Public
All land is devoted to social, religious, educational, cultural, and political activities; this would include the office and service employment classifications.

The Plymouth planning area consists of all four types of land use. The area outside the current town limits is mostly residential, with some industrial and commercial development. Within municipal limits, all types of land uses prevail. Commercial development is predominant along the US 64 corridor. The majority of the remaining land use within the town limits is residential and industrial.

The anticipated land use development for the planning area is predominantly residential, industrial, and commercial. Industrial and commercial growth is expected to continue along the US 64 corridor. The extension of municipal water and sewer service to the west and south is expected to spur development in these areas. Furthermore, the Town plans waterfront development to include a lighthouse and maritime museum.

Economic Trends

Travel patterns in an area reflect the economic environment. Employment was used as an indicator of economic activity for the Plymouth planning area. **Table 3** presents employment data for the 1999 base year and the projected employment for the 2025 future year. A summary of employment by zone is included in **Appendix A**.

Table 3. Employment for the Plymouth Planning Area

Classification	1999	2025
Total Employment	3685	6235
Industry	1909	2909
Retail	326	676
Special Retail	285	635
Office	458	788
Services	707	1227

Vehicle Registration

Growth in vehicle registration tends to mirror growth in traffic volumes. As the number of vehicles increases, a greater strain is placed on the existing road network. Additional traffic volumes will result in additional safety hazards and congestion. To alleviate traffic congestion, steps must be taken towards constructing new roads, enhancing existing facilities, and providing for travel via other transportation modes.

In the past, vehicle registrations have increased at a greater rate than population. This increase is best understood with the analysis of the persons per registered vehicle ratio over time. This ratio, which is obtained by dividing the total county population by the total vehicles registered in the county, is summarized for past years in **Table 4**. These results illustrate the transition from a non-automobile oriented society to a heavily auto-dependent society over time. The results are also indicative of increasing income. This means that more vehicle trips are being produced, and, as a result, traffic and congestion on the street system are growing at a faster rate than population.

Table 4. Persons per Registered Vehicle for Washington County

Year	Registered Vehicles	Population	Persons/Reg. Vehicle
1970	6,098	14,038	2.30
1975	8,292	15,100	1.82
1980	9,221	14,801	1.61
1985	9,244	14,285	1.55
1990	9,882	13,997	1.42
1995	10,308	13,756	1.33
1997	12,035	13,297	1.10

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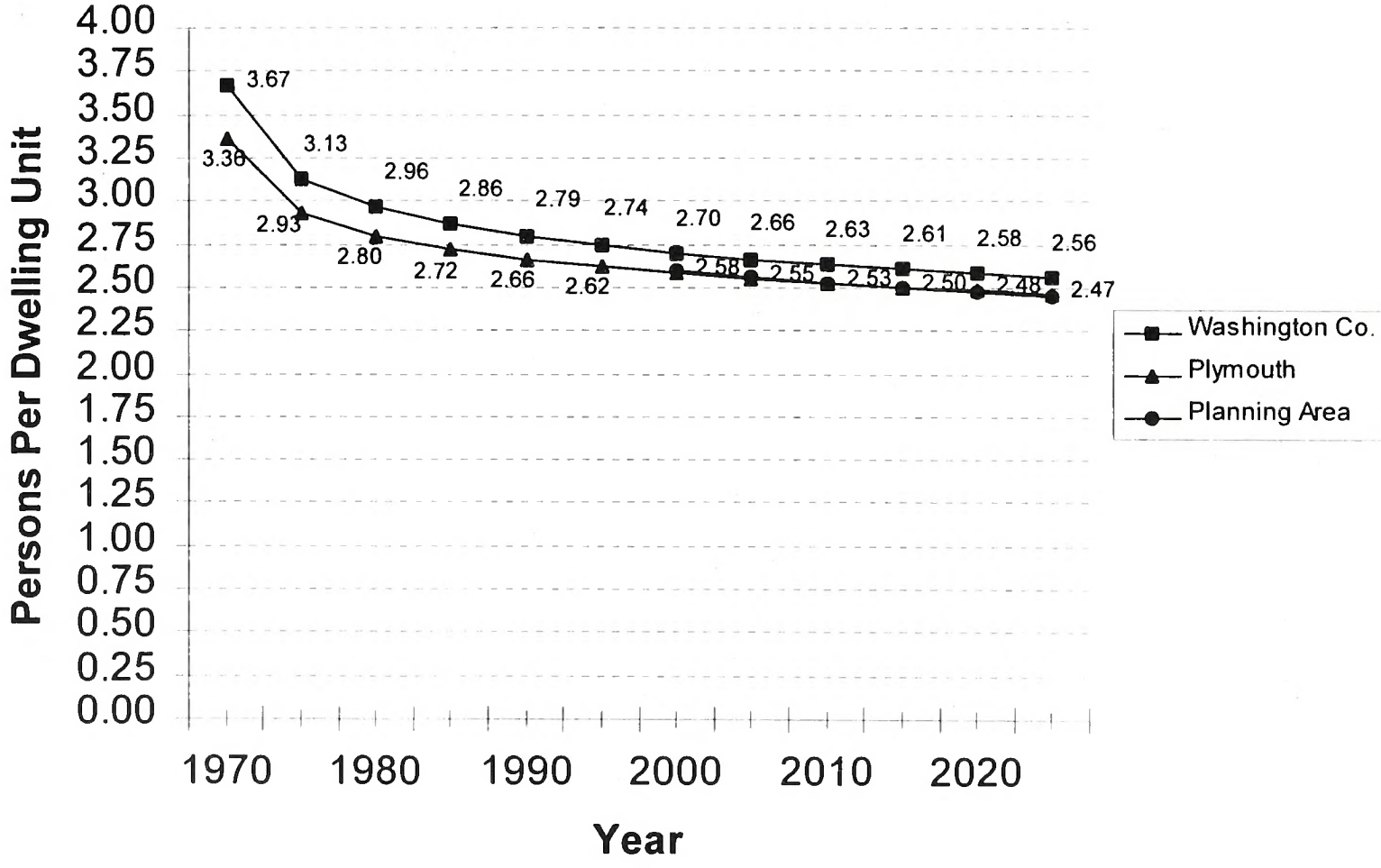

Dwelling Unit Occupancy Rates
Persons Per Dwelling Unit
4.00
3.75
3.50
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1970
1980
1990
2000
2010
2020
Year
3.67
3.13
2.96
2.86
2.79
2.74
2.70
2.66
2.63
2.61
2.58
2.56
3.36
2.93
2.80
2.72
2.66
2.62
2.58
2.55
2.53
2.50
2.48
2.47
Washington Co.
Plymouth
Planning Area

FIGURE 8

VI. ENVIRONMENTAL CONCERNS

In recent years, the environmental considerations associated with highway construction have come to the forefront of the planning process. Section 102 of the National Environmental Policy Act (NEPA) requires the completion of an Environmental Impact Statement (EIS) for projects that have a significant impact on the environment. The EIS includes impacts on wetlands, wildlife, water quality, historic properties and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, consideration for many of these factors was incorporated in the development of the Thoroughfare Plan.

Wetlands

Wetlands are those lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities inhabiting the soil. Wetlands are crucial ecosystems in our environment; they help to regulate and maintain the hydrology of rivers, lakes, and streams by storing and slowly releasing flood waters. Wetlands help maintain the quality of water by storing nutrients, reducing sediment loads, and reducing erosion. Wetlands are also critical to fish and wildlife populations, providing an important habitat for approximately one-third of the plant and animal species that are listed as threatened or endangered.

The impacts to wetland areas within the Plymouth planning area were determined with the use of the National Wetlands Inventory Mapping provided by the U. S. Fish and Wildlife Service. The location of wetlands within the planning area is shown in **Figure 9**. Minimal impacts to wetlands and other water resources are expected to result from recommended improvements. However, this mapping is merely a best estimate of the approximate location of wetlands, based upon aerial photography rather than field data. Therefore, more extensive investigations will be required prior to the design of any recommended facilities.

Threatened and Endangered Species

The Threatened And Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a roadway project on endangered animal and plant species, as well as critical wildlife habitats. Locating any rare species that exist within the planning area during this early planning stage will help to avoid or minimize impacts.

A preliminary review of the Federally Listed Threatened and Endangered Species in the Plymouth area was completed to determine what effects, if any, the recommended improvements may have on wildlife. Mapping from the N. C. Department of Environment and Natural Resources revealed occurrences of threatened or endangered plant and/or animal species, which are summarized in **Table 5**.

Table 5. Threatened or Endangered Species within the Planning Area				
Species	Common Name	Major Group	Status*	
			NC	Federal
Alligator mississippiensis	American Alligator	Reptile	T	T(S/A)
Anodonta implicata	Alewife Floater	Mollusk	SC	n/a
Canis rufus	Red Wolf	Mammal	SR	LEXN
Condylura cristata	Star-nosed mole	Mammal	SC	n/a
Corynorhinus rafinesquii	Rafinesque's big-eared bat	Mammal	SC	FSC
Fundulus waccamawensis	Waccamaw killifish	Fish	SC	FSC
Haliaeetus leucocephalus	Bald eagle	Bird	E	LT
Leptodea ochracea	Tidewater Mucket	Mollusk	SC	n/a
Ligumia nasuta	Eastern Pondmussel	Mollusk	SC	n/a
Lilawopsis carolinensis	Carolina Grasswort	Vascular plant	T	n/a

* See **Appendix F** for definitions of status.

Historic Sites

Section 106 of the National Historic Preservation Act requires the Department of Transportation to identify historic properties listed in, as well as eligible for, the National Register of Historic Places (NRHP). The DOT must consider the impacts of road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

N. C. General Statute 121-12(a) requires the NCDOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. The NCDOT must consider the impacts and consult with the N. C. Historical Commission, but is not bound by their recommendations.

The location of historic sites within the Plymouth area was investigated to determine any possible impacts resulting from the recommended improvements. This investigation identified only one property listed on the NRHP, the Thomas J. Gill House. This historic building is located along Everett Street and is not anticipated to be impacted by any of the recommended improvements.

Archaeological Impacts

The location of recorded archaeological sites was researched to determine the possible impacts of proposed roadway projects. Based upon this initial investigation, no archaeological sites should be impacted by the recommended improvements. However, archaeological sites are often difficult to identify without actual field excavation. As a result, possible sites may not be identified during the initial planning process; therefore, each proposed project should be evaluated individually prior to construction.

Housing and Neighborhoods

The preservation of cohesive neighborhoods is a fundamental aspect of thoroughfare planning. When specific streets are designated as thoroughfares, heavy traffic is minimized on neighborhood streets, thereby minimizing negative

impacts. In order to reduce heavy traffic on residential streets, it is imperative that new facilities be constructed and deficient facilities be improved.

Educational Facilities

The location of educational facilities in the Plymouth planning area was considered during the development of the thoroughfare plan. No proposed facilities or improvements shall displace any school or other educational facility.

Blank

Plymouth Planning Area

Wetlands & Water Resources

- Major Water Bodies
- Major River Basins
- Minor River Basins
- Major Rivers & Streams
- Hydrologic Units
- HQW Zones

Water Supply Watersheds

- Critical
- Protected

DCM Wetlands

- Estuarine
- Pocosin
- Riverine
- Flats
- Drained Wetland
- Cutover Wetland
- National Wetlands Inventory
- Municipal Boundaries
- Railroads

Roadways

- Interstate
- US
- NC
- SR
- City
- Unknown
- Planning Area Boundary

N
W E
S

0 8000 Feet

Figure 9

VII. Traffic Model Development

The development of the 2000 Plymouth Thoroughfare Plan involved the development of a model to replicate travel in the planning area. This model applied the traditional four-step planning process (trip generation, trip distribution, mode choice, and trip assignment) to both the 1999 base year and the 2025 design year.

Prior to application of the four-step process, the planning area was delineated and the 1999 base year network was developed. Next, socioeconomic data and traffic data were applied to the four-step process, simulating the 1999 traffic patterns of the planning area. Once the traffic model accurately reflected the traffic counts, the socioeconomic data was projected to the 2025 design year and the four-step process was repeated. The existing street system was then loaded with the projected traffic volumes. This loaded network was analyzed for deficiencies, and alternate solutions for these anticipated capacity deficiencies were evaluated.

The Planning Area

The Plymouth planning area encompasses the current town limits, as well as the outlying portion of Washington County where the Town anticipates urban development by the 2025 design year. The Washington County line defines the western planning area boundary and the Roanoke River serves as the northern planning area boundary. Current and anticipated land use and discussions with the Plymouth Town Manager led to the determination of the remaining boundary lines.

Data collection efforts required the division of the planning area based upon common land use into thirty-two travel analysis zones. The smaller zones in the downtown area represent high density areas, while the larger zones represent areas of lower density. The planning area and traffic analysis zones are shown in **Figure 10**.

The Base Year Network

Once the planning area was delineated and divided into zones, the base network was developed. Since the purpose of the traffic model was to duplicate the prevailing conditions of the existing street system, the base network needed to include enough streets on the actual street system to accurately represent the traffic patterns found within the planning area. The base year network chosen includes all streets carrying substantial volumes of traffic. Major and minor thoroughfares were included, as well as some local streets. **Figure 11** presents the base year network for the Plymouth planning area.

Characteristics of the modeled streets, including speed, distance, and capacity, are important components of the base year network. The speed and distance along each modeled roadway define the minimum time paths between traffic analysis zones. These minimum time paths serve as the basis in the model for assigning traffic to the streets in the system. Generally in the Plymouth model, the speeds assigned to the streets were at or slightly below the posted speed limit, representing as closely as possible the actual speed of traffic traveling on the facility.

Trip Generation

The model predicts travel for three different types of trips within the planning area: through trips, internal trips, and external ← → internal trips. Through trips are those trips produced outside the planning area which pass through in route to a destination located outside the planning area. Internal trips are those trips having both their origin and destination inside the planning area. Internal trips can be further stratified by trip purpose: home based work, home base other, and non-home based. External ← → internal trips are those having one trip end within and one trip end outside of the planning area.

Trip generation, the first step of the traditional four-step travel demand forecasting process, estimates how many trips are produced by, and attracted to, a traffic analysis zone. The NCDOT uses an in-house program, Internal Data Summary (IDS), to perform trip generation. Trip productions within each zone were determined by applying generation rates to the total dwelling units, commercial autos, and taxis in each zone. In order to account for varying trip generation rates, the dwelling units were stratified into the following groupings: above average, average, and below average. This stratification uses housing conditions as a surrogate for trip making. Each classification of housing was assigned a coefficient representing the total trips made per household. The generation rates for dwelling units, commercial autos, and taxis are presented in **Table 6**.

Trip attractions were determined using a set of regression equations. These equations relate the trips that are attracted to each zone to the employment that exists in the zone. The equations used for the model are as follows:

HBW	Y=	1.0X1	+	1.0X2	+	1.0X3	+	1.0X4	+	1.0X5		
HBO	Y=	0.2X1	+	2.0X2	+	8.4X3	+	2.6X4	+	2.5X5	+	0.5X12
NHB	Y=	0.4X1	+	2.0X2	+	8.4X3	+	2.6X4	+	2.5X5	+	0.5X12
EXT-INT	Y=	1.0X1	+	2.0X2	+	8.4X3	+	2.6X4	+	2.5X5	+	1.0X12

where
- Y= Attraction factor;
- X1= Industry (SIC 1-49);
- X2= Retail (SIC 50-54, 56,57,59);
- X3= Special Retail (SIC 55, 58);
- X4= Office (SIC 60-67, 91-97);
- X5= Services (SIC 70-76, 78-79,99); and
- X12= Attraction caused by total housing per zone

Attraction factors for each trip purpose were adjusted so that total attractions would equal total productions.

Internal Trip Analysis

Internal zone-to-zone trips were broken into three categories: home based work (HBW), home based other (HBO), and non-home based (NHB). A trip breakdown by type is presented in **Table 6**. In addition to these types of trips, the model also accounts for secondary trips made within the planning area by vehicles garaged

outside the planning area. These secondary non-home based trips (NHB2) were calculated using the following formula:

$$NHB2 = [\,(\text{Total E} \leftarrow\rightarrow \text{I Trips}) - (\text{Int} \rightarrow \text{Ext Trips})\,] \times F$$

Where
Total E ← → I Trips = Total External to Internal Trips
Int → Ext Trips = Total Trips - %Internal of Total Trips
F = Factor based on number of in-commuters making secondary trips

1999 NHB2 = (17,446 – 2,338) x 0.6 = 9,065

2025 NHB2 = (34,436 – 4,488) x 0.6 = 19,466

Through Trip Analysis

The through trip table for this study was developed using the SYNTH computer program developed by J. T. McDonnell, P.E., which is based upon Technical Report Number 3, Synthesized Through Trip Table for Small Urban Areas, by David G. Modlin, Jr., Ph.D., P.E. This method of deriving through trips is based upon the fratar balancing method, which balances the trip interchanges at the external stations. **Table 9** presents a summary of travel at the external stations.

Table 6. Travel Model Input Variables

Generation Rates for Housing	**1999 Base Year**		**2025 Design Year**	
Above Average	10.50		10.73	
Average	9.50		9.73	
Below Average	7.95		8.18	
Taxi	40.00		40.00	
Commercial Cars	4.90		4.90	
Commercial Trucks	5.70		5.70	
Trips by Purpose	**1999 Base Year**		**2025 Design Year**	
Internal of Total	19,462	90%	36,731	90%
Home-Based Work (HBW)	4,518	23%	8,448	23%
Home-Based Other (HBO)	9,821	50%	18,366	50%
Non-Home Based (NHB)	5,303	27%	9,917	27%
Persons per Household	2.60		2.45	
Average Daily Trips per Household	8.76		9.17	
Employment-Population Ratio	0.57		0.57	

Trip Distribution

Trip distribution is the next phase in the travel demand forecasting process. Trip distribution uses the productions and attractions output by trip generation to create trip origins and destinations for each zone. The gravity model was used to distribute trips across the network based upon the relative attractiveness of the destination zone and the distance from the productions. The gravity model is based on the

concept that the trips from one zone to another zone is proportional to the trip attractions and productions at each zone and inversely proportional to the impedance (or travel time) between the zones.

The gravity model is expressed by the following equation:

$$Tij = Pi \times \frac{Aj \times Fij \times Kij}{\sum_{j=1}^{n} (Aj \times Fij \times Kij)}$$

where:

	Tij	=	Number of trips produced in zone i and attracted to zone j
	Pi	=	Number of trips produced in zone i
	Aj	=	Number of trips attracted in zone j
	Fij	=	Friction factor from zone i to zone j
	Kij	=	Socio-economic adjustment factor
	n	=	Total number of zones
	I	=	Origin zone number
	j	=	Destination zone number

The friction factor, or travel time factor, is critical to the gravity model distribution. The distance between traffic zones and the time required to travel those distances affects the friction factor. It is also related to the specific trip purpose (HBW, HBO, NHB, NHB2, and E← →I). The friction factors for the Plymouth model were derived from those developed for a similar study. These factors, which are summarized in **Table 7**, were adjusted to reflect travel times for the study area for each trip purpose and input into the gravity model.

Table 7. Friction Factors

Time Interval (Minutes)	Friction Factors (Trips Distributed)			
	HBW	HBO	NHB	E → I
1	250	250	100	350
2	1000	1000	900	1400
3	2271	2119	1200	2895
4	971	870	800	1426
5	516	449	600	838
6	309	263	400	542
7	159	127	107	373
8	86	62	49	172
9	70	52	26	118
10	42	31	12	78
11	0	0	6	30
12	0	0	0	0

Mode Split

Mode split, the third phase of the travel demand forecasting process, Involves allocating trips to the various modes, such as auto or transit. Since no public transportation element exists or is anticipated in the future within the Town of Plymouth, all trips are assumed to be automobile trips.

Trip Assignment

The last phase of the travel demand forecasting process is trip assignment. Trip assignment determines the route used to complete a trip and loads all trips onto the network. The all-or-nothing method is the simplest form of loading and was used to load the network. For each zone-to-zone pair, this method assigns all trips to the route with the shortest time. No trips are assigned to the other competing routes.

Calibration and Model Validation

The planning area was divided into quadrants using an east-west screenline and two north-south screenlines. The first screenline follows the Carolina and Northwestern railway from the eastern planning area boundary along until just north of the intersection of the railroad with US 64 and then proceeds between US 64 and the CSX railway to the western planning area boundary. The second screenline, located in the western portion of the planning area, begins at the southern planning area boundary first following the Carolina and Northwestern railway and then the CSX railway to the northern planning area boundary. The final screenline is located in the eastern portion of the planning area and follows various tributaries of Conaby Creek between the northern and southern planning area boundaries. These screenlines are imaginary lines running through the planning area that were used to check the volume of travel dispersing throughout the traffic model.

The screenlines, as illustrated in **Figure 10**, were chosen in conjunction with the determination of the planning area. Traffic counts were taken at each location where a roadway crossed the screenline or cordon line. In addition, counts were taken at locations throughout the planning area to help determine travel patterns and validate the model.

Once the model distributed trips across the network using an all-or-nothing loading assignment, the assigned volumes were compared to actual ground counts across the three screenlines. The model is considered to be calibrated when the computer generated screenline totals are within 10% of the actual ground counts. The screenline comparisons are summarized in **Table 8**.

Table 8. Model Validation

Screenline	Actual Count	Model Volume	Difference
East-West	26,460	25,801	2%
North-South (Western)	16,470	14,967	9%
North-South (Eastern)	20,066	18,799	6%

Data Projections

Once the calibration of the base year model was complete, inputting projected socioeconomic data into the calibrated model simulated anticipated design year traffic conditions. The future internal trips were estimated by projecting the housing and employment data to the design year and then allocating these projections to individual traffic analysis zones. The projections were developed based upon historical trends for Washington County and the Town of Plymouth, and coordination with the local government. The allocation of these projections was based upon the existing and anticipated development throughout the planning area. Future external and through trips for the 2025 design year were projected from the base year traffic using a linear projection of past growth rates and knowledge of the area's development patterns.

For the design year analysis, an increase in the generation rates was determined as follows:

$$\text{Generation Rate Increase} = (\text{Avg. 1999 Trip Rate} \times \text{Composite Factor}) - \text{Avg. 1999 Trip Rate}$$

Where:

$$\text{Composite Factor} = \frac{\text{1999 Vehicle Ownership}}{\text{2025 Vehicle Ownership}} \times \text{Usage Factor} \times \frac{\text{2025 Persons/DU}}{\text{1999 Persons/DU}}$$

Average 1999 Trip Rate	=	8.76 trips/day
1999 Vehicle Ownership	=	1.10 vehicles/person
2025 Vehicle Ownership	=	1.10 vehicles/person
1999 Persons/DU	=	2.60 persons/DU
2025 Persons/DU	=	2.45 persons/DU
Usage Factor	=	0.99

$$\text{Composite Factor} = \frac{1.10}{1.10} \times 0.99 \times \frac{2.45}{2.60}$$

$$= 1.026$$

$$\therefore \text{Generation Rate Increase} = (8.76 \times 1.026) - 8.76 = 0.23$$

External and through trip projections for the 2025 design year were projected from the base year traffic using a linear projection of past growth rates along with knowledge of the area's development patterns. **Table 9** presents the external ← → internal and through trip-ends determined, along with the corresponding traffic count at each station.

Table 9. Cordon Station Travel									
STATION		1999 BASE YEAR				2025 DESIGN YEAR			
Number	Location	Total ADT	% Through Trips	Through Trip Ends	Ext ←→ Int Trips	Total ADT	% Through Trips	Through Trip Ends	Ext ←→ Int Trips
45	US 64	8,842	48.03	4,246	4,596	17,600	48.0	8,447	9,153
46	SR 1300	2,291	28.04	354	1,937	4,900	15.5	760	4,140
47	US 64	9,530	49.82	4,248	5,282	18,350	44.7	8,200	10,150
48	NC 45	1,617	29.25	324	1,293	3,400	20.0	680	2,720
49	SR 1112	247	5.00	10	237	500	3.8	19	481
50	SR 1115	644	5.00	24	483	1,000	4.8	48	952
51	NC 32-45	3,609	38.87	1,408	2,201	6,300	39.1	2,463	3,837
52	SR 1100	1,887	25.00	470	1,417	4,000	24.9	997	3,003
Totals		**28,667**		**11084**	**17446**	**56,050**		**21,614**	**34,436**

Blank

ZONE MAP

LEGEND

CORDON LINE

SCREEN LINE

ZONE LINE

ZONE NUMBER 32

FIGURE 10

PLYMOUTH

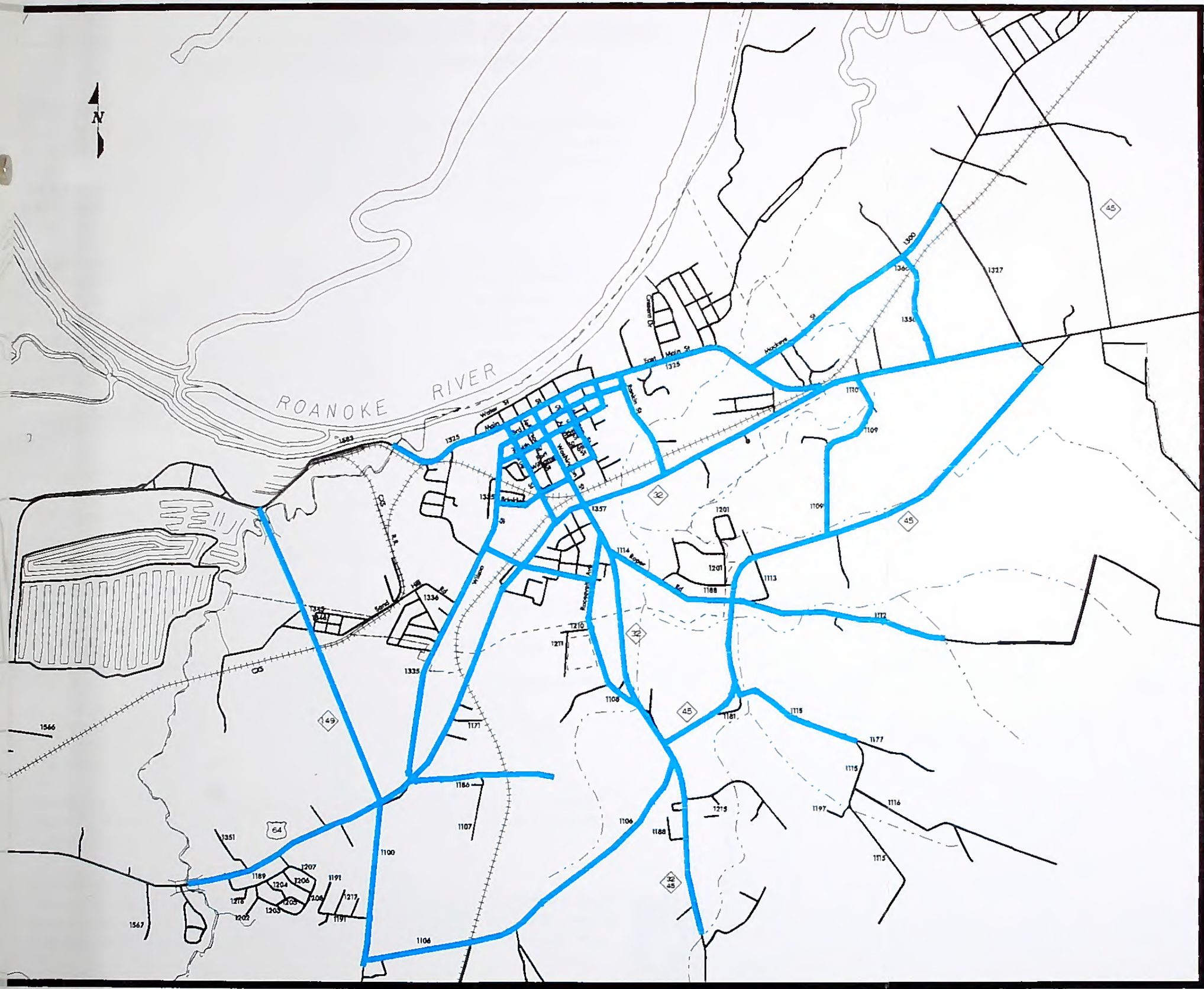
WASHINGTON COUNTY
NORTH CAROLINA

PREPARED BY

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scale
0 600 1200 2400 3600 4800 6000
feet

Base Map Date
May 17, 2000



TRANPLAN
NETWORK

LEGEND

MODELED NETWORK STREET

FIGURE 11

PLYMOUTH

WASHINGTON COUNTY
NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

scale
0 600 1200 2400 3600 4800 6000
feet

Base Map Date
May 17, 2000

VIII. Thoroughfare Planning Principles

Objectives

Typically, the urban street system occupies 25-30% of the total developed land in an urban area. Since the system is permanent and is expensive to build and maintain, much care and foresight are required in its development. Thoroughfare planning is the process used by public officials to assure the development of the most appropriate street system to meet existing and future travel desires within the urban area.

The primary objective of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase. In addition, it will alleviate unnecessary improvements, thereby averting needless expense. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should include those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- providing for the orderly development of an adequate major street system as land development occurs;
- reducing travel and transportation costs;
- reducing the cost of major street improvements to the public through the coordination of the street system with private action;
- enabling private interests to plan their actions, improvements, and development with full knowledge of public intent;
- minimizing the disruption and displacement of people and businesses through long-range advance planning for major street improvements;
- reducing environmental impacts, such as air pollution that results from transportation; and
- increasing travel safety.

Thoroughfare planning objectives are achieved by both improving the operational efficiency of thoroughfares and by improving the system efficiency through system coordination and layout.

Operational Efficiency

The operational efficiency of a street is improved by increasing the street's capability to carry additional vehicular traffic and people. In terms of vehicular traffic, capacity is defined as the maximum number of vehicles which can pass a given point on a

roadway during a given time period under prevailing roadway and traffic conditions. The physical features of the roadway, nature of traffic, and weather affect capacity.

Physical methods of improving vehicular capacity include street widening, intersection improvements, improved signalization, vertical and horizontal alignment improvements, and the elimination of roadside obstacles. For example, widening a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic, thereby reducing the impedances to traffic flow caused by slow moving or turning vehicles and the adverse effects of horizontal and vertical alignments.

The vehicular capacity of a road may be improved with the implementation of several operational measures. The following are examples of operational improvements to street capacity:

Control of access: A roadway with complete control of access can often carry three times the traffic handled by a non-controlled access street with identical lane width and number. An example of this would be US 74 Bypass;

Parking removal: By removing parking along a roadway, capacity is increased since there is additional street width for traffic flow and the friction to flow caused by parking vehicles is reduced;

One-way operation: The capacity of a street can sometimes be increased by 20% to 50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

Reversible lanes: Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

Signal phasing and coordination: Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Intelligent Transportation Systems (ITS): This involves applying advanced concepts and technology in the area of communications, navigation, and information systems to provide solutions to traffic congestion and, at the same time, improve travel safety and reduce environmental effects. It covers passengers, freight, and public transit vehicles and fleets. The ITS Program is structured according to five major system areas:

- ***Advanced Traffic Management System:*** Provides real-time adjustment of traffic control systems and real-time means for transportation operators to effectively monitor traffic conditions and

communicate to devices, quickly adjust traffic operations, and promptly respond to incidents;

- ***Advanced Traveler Information System:*** Provides continuous advice regarding traffic conditions, alternate routes, and warnings regarding road safety;
- ***Commercial Vehicle Operations:*** Improves operations efficiency and productivity of trucks, buses, and other fleets or vehicles and improves the efficiency of necessary regulatory activities;
- ***Advanced Vehicle Control:*** Vehicle and/or roadway based electromechanical and communication devices that enhance the control of vehicles by facilitating and augmenting driver performance and ultimately relieving the driver of most tasks on designated instrumented roadways; and
- ***Advanced Public Transportation Systems:*** Providing mass transport users and operators (such as buses, vanpoolers, high-occupancy vehicle lanes, carpools, taxicabs) with up-to-date information on status, schedules, and availability of public transit systems including automatic vehicle location and monitoring systems to improve fleet management as well as electronic free media.

High-Occupancy Vehicle Lanes (HOV Lanes): This involves designating existing traffic lanes for exclusive use by high-occupancy vehicles such as carpools, vanpools, and buses. These can be altered according to demand to increase capacity. For example, some HOV lanes can be designated HOV only during peak hours and/or HOV lanes can be reversible between the morning and afternoon peak hours to reflect the shift in directional flow of traffic.

Altering travel demand is a third method of improving the vehicular capacity of existing streets. The capacity of a road can be increased without requiring physical changes to the characteristic of the road. Travel demand can be reduced or altered in the following ways:

- Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people-carrying capacity of the street system;
- Promoting the use of transit and bicycle modes;
- Encouraging industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will spread peak travel over a longer time period, thereby reducing peak hour demand; and
- Planning and encouraging land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

The two primary functions of roadways are traffic service and land service. However, when combined, these are basically incompatible. If the demand for traffic and land service are low, then this conflict is not serious. When traffic volumes are high, however, conflicts created by uncontrolled and intensely used adjacent property results in intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is to provide a functional system of streets which permits travel between origins and destinations with directness, ease, and safety. Various streets within the system are designed to perform specific functions, thereby minimizing traffic and land service conflict. Streets are categorized by function as local access streets, minor thoroughfares, or major thoroughfares.

Local access streets provide access to abutting property and are not intended to carry heavy volumes of traffic. The location of these facilities should dictate that only traffic having origins and destinations on those streets are served. Local streets may be further classified as either residential, commercial, and/or industrial, depending upon which type of land use they serve.

Minor thoroughfares are facilities which collect traffic from local access streets and carry this traffic to the major thoroughfares. In some instances, minor thoroughfares may supplement the major thoroughfare system by facilitation of minor through traffic movements. In addition, minor thoroughfares provide access to abutting property. They should be designed to serve limited areas in order to prevent their development as major thoroughfares.

Major thoroughfares are the primary traffic arteries of an area. The function of a major thoroughfare is to move intra-city and inter-city traffic. Since they are intended to carry traffic, the streets which comprise the major thoroughfare system are strongly discouraged from serving abutting property. They should not be bordered by uncontrolled strip development since such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to a major expressway with four or more travel lanes. Parking should normally not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system that is most adaptable to desire lines of travel within an urban area is the radial-loop system. This system permits movement between various areas of the city with maximum directness. The functional elements of this system, shown in **Figure 12**, include radial streets, crosstown streets, loop system streets, and bypasses.

Radial streets service traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district (CBD) depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this, a system of crosstown streets forming a loop around the CBD is necessary. This system allows traffic to move from origins located on one side of the central area to destinations on the other side, following the border of the area. In addition, central area traffic is permitted to circle and then enter the area near a given destination. An effective crosstown system will free the central area of crosstown traffic, permitting the central area to function more adequately in its role.

Bypasses are designed to carry traffic through or around the urban area, removing traffic which has no desire to be in the city, thus providing relief to the city street system. Bypasses are normally designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volumes can be designed to function as a portion of an urban loop. A bypass will expedite the movement of through traffic, improving traffic conditions within the city. Since the local streets are freed for use by shopping and home-to-work travel, bypasses tend to increase the economic vitality of the local area.

Applications of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, functional classification, and the idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, a thoroughfare plan is developed for established urban areas and is constrained by the existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these constraints and the many other factors that affect major street locations.

Throughout the thoroughfare planning process, it is necessary from a practical viewpoint that the following basic principles be followed as closely as possible:

- The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as factors that contribute to it, limit it, and modify it;

- Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on relatively few streets;
- The plan should conform to and provide for the land development plan of the area;
- Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to design thoroughfares on a long-range planning basis to protect right-of-way for future thoroughfare development; and
- While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

IDEALIZED THOROUGHFARE PLAN

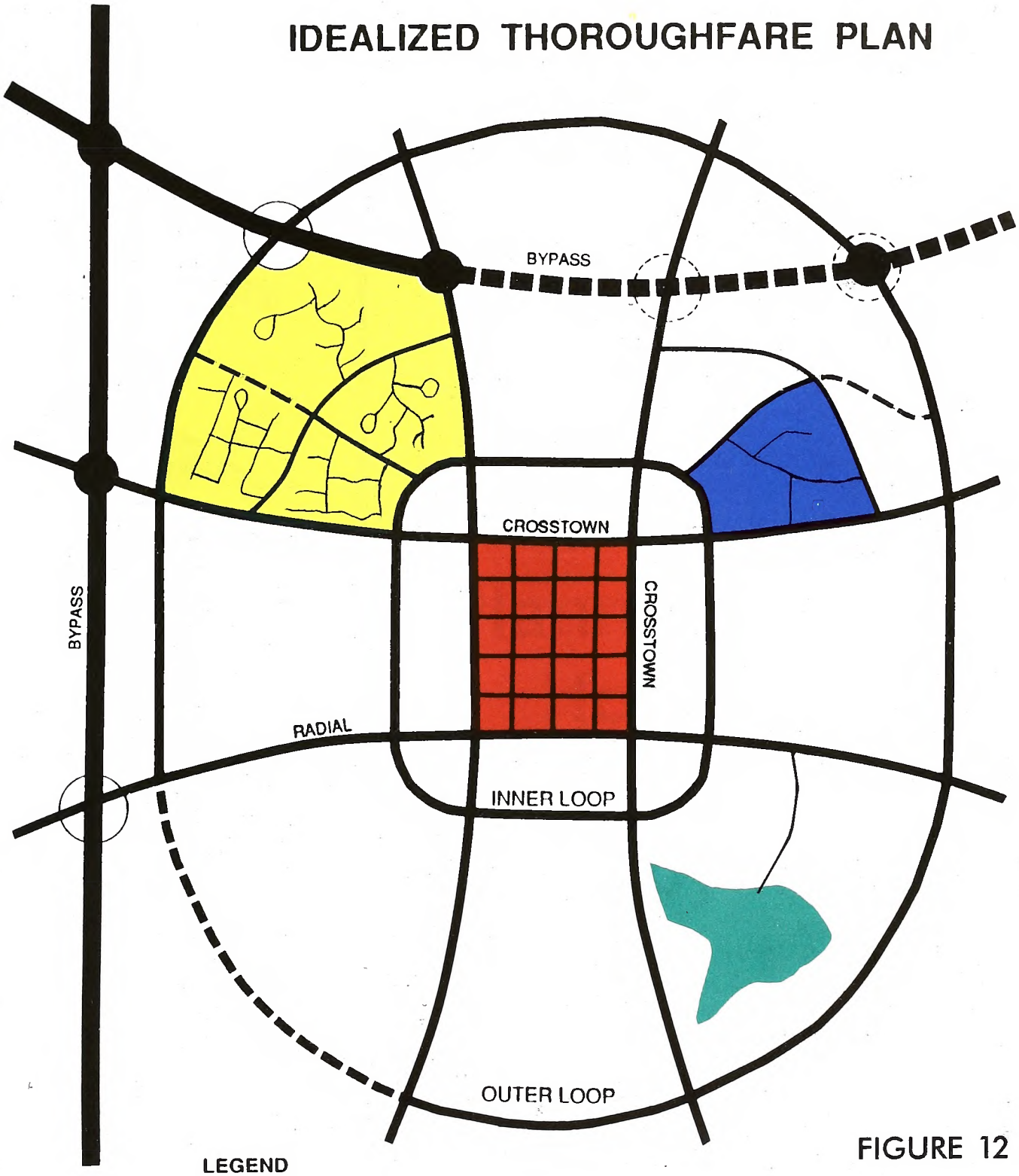


FIGURE 12

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE FREEWAY		
MAJOR OTHER		
MINOR THOROUGHFARE		
LOCAL ROAD		
INTERCHANGE		
GRADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

APPENDIX A

Planning Area Housing & Employment

Table 10. 1999 Socio-Economic Data										
Zone	Housing Summary				Employment Summary					
	Above Average	Average	Below Average	Total	Industry	Retail	Special Retail	Office	Service	Total
1	0	16	41	57	0	0	4	9	12	25
2	13	16	18	47	32	21	1	246	112	412
3	5	32	17	54	0	0	1	0	10	11
4	0	57	60	117	0	1	0	0	1	2
5	0	48	29	77	0	0	0	6	8	14
6	0	15	73	88	0	0	0	0	10	10
7	0	15	31	46	0	0	0	0	14	14
8	0	9	11	20	0	0	0	0	1	1
9	6	136	138	280	0	1	0	0	78	79
10	7	39	0	46	0	0	0	0	0	0
11	19	4	1	24	0	0	0	0	0	0
12	0	73	38	111	0	0	0	0	4	4
13	1	6	22	29	0	0	0	0	5	5
14	0	1	0	1	13	18	0	0	0	31
15	16	84	3	103	104	141	98	6	72	421
16	0	27	14	41	1	115	80	173	194	563
17	3	24	17	44	0	0	0	0	0	0
18	2	8	5	15	0	0	0	0	0	0
19	2	5	8	15	0	0	0	0	0	0
20	2	97	169	268	40	22	84	11	116	273
21	1	22	37	60	3	0	0	0	3	6
22	0	17	5	22	0	0	0	0	8	8
23	4	23	45	72	0	0	0	0	0	0
24	0	32	60	92	6	0	0	0	4	10
25	26	102	27	155	18	0	0	0	3	21
26	3	21	76	100	44	1	3	0	0	48
27	1	27	123	151	65	0	0	7	27	99
28	0	43	80	123	1	0	0	0	4	5
29	0	1	0	1	0	0	0	0	0	0
30	0	6	30	36	0	0	0	0	0	0
31	2	108	85	195	2	6	14	0	21	43
32	0	0	0	0	1580	0	0	0	0	1580
Totals	***113***	***1114***	***1263***	***2490***	***1909***	***326***	***285***	***458***	***707***	***3685***

Table 11. 2025 Socio-Economic Data										
Zone	Housing Summary				Employment Summary					
	Above Average	Average	Below Average	Total	Industry	Retail	Special Retail	Office	Service	Total
1	0	16	61	77	0	0	4	9	12	25
2	13	16	18	47	32	41	1	296	132	502
3	25	57	17	99	0	0	1	30	35	66
4	0	60	60	120	0	11	0	50	31	92
5	0	52	29	81	0	10	0	56	28	94
6	0	18	73	91	0	10	0	50	35	95
7	0	15	31	46	0	0	0	50	34	84
8	40	39	11	90	0	0	0	0	41	41
9	26	156	158	340	0	1	0	0	78	79
10	7	39	0	46	0	0	0	0	0	0
11	79	104	51	234	0	0	0	0	0	0
12	10	103	38	151	0	0	0	0	4	4
13	1	46	22	69	0	0	0	0	5	5
14	0	11	0	11	63	93	60	0	50	266
15	16	84	3	103	254	181	148	6	92	681
16	0	47	24	71	151	150	130	223	214	868
17	3	54	17	74	200	75	50	0	50	375
18	32	33	5	70	0	0	0	0	0	0
19	22	30	8	60	0	0	0	0	0	0
20	22	147	179	348	240	72	159	11	166	648
21	1	72	37	110	53	0	0	0	23	76
22	0	27	5	32	0	0	0	0	8	8
23	24	73	45	142	0	0	0	0	0	0
24	0	82	160	242	106	0	0	0	4	110
25	46	177	127	350	18	0	15	0	53	86
26	3	121	211	335	94	1	23	0	30	148
27	1	47	143	191	115	25	30	7	77	254
28	0	173	80	253	1	0	0	0	4	5
29	0	51	130	181	0	0	0	0	0	0
30	0	141	30	171	0	0	0	0	0	0
31	12	158	85	255	2	6	14	0	21	43
32	0	0	0	0	1580	0	0	0	0	1580
Totals	***383***	***2249***	***1858***	***4490***	***2909***	***676***	***635***	***788***	***1227***	***6235***

APPENDIX B

Local Government & Public Participation

The local staff, government, and citizens of the Town of Plymouth were actively involved in the development of the 2000 Thoroughfare Plan. Several meetings with local staff and presentations to local citizens conducted throughout the course of the study insured that the Thoroughfare Plan would meet the needs and desires of Plymouth.

Meetings and Presentations

August 19, 1998	Meeting with Mayor Jarahnee Bailey and Town Manager Michael Lord to discuss past thoroughfare planning for the Town and this update.
September 21, 1998	Open meeting with the Plymouth Planning Board to present an overview of the thoroughfare planning process.
September 29, 1999	Meeting with Town Manager Michael Lord to discuss development of thoroughfare plan, population & employment projections, and anticipated land use development.
June 21, 2000	Presentation of Recommended Thoroughfare Plan to the Town Planning Board.
August 7, 2000	Joint Public Informational Workshop with Washington County.
September 11, 2000	Presentation of Recommended Thoroughfare Plan to City Council.

APPENDIX C

Recommended Subdivison Ordinances

Definitions

I. Streets and Roads
   A. Rural Roads
      1. Principle Arterial: A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
      2. Minor Arterial: A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
      3. Major Collector: A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.
      4. Minor Collector: A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.
      5. Local Road: A road which serves primarily to provide access to adjacent land, over relatively short distances.

   B. Urban Streets
      1. Major Thoroughfares: Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
      2. Minor Thoroughfares: Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
      3. Local Street: A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

   C. Specific Type Rural or Urban Streets
      1. Freeway, expressway, or parkway: Divided multi-lane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.
      2. Residential Collector Street: A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
      3. Local Residential Street: Cul-de-sacs, loop streets less than 2500 ft in length, or streets less than 1.0 miles in length that do not connect

thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac: A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.
5. Frontage Road: A road that is parallel to a partial of full access controlled facility and provides access to adjacent land.
6. Alley: A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line: A line parallel to the street in front of which no structure shall be erected.

B. Easement: A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot: A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development, or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider: Any person, firm, corporation, or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision: All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increases and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than 10 acres where not street right-of-way dedication is involved; (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 2 acres into not more than three lots, where not street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication: A gift, by the owner, or his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation: Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally, the proposed streets should be the extension of existing streets, if possible.

A. Right-of-Way Widths: Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

1. Rural	Minimum ROW (feet)
a. Principal Arterial	
Freeways	350
Other	200
b. Minor Arterial	100
c. Major Collector	100
d. Minor Collector	80
e. Local Road	60

2. Urban	Minimum ROW (feet)
a. Major Thoroughfare other than Freeway/Expressway	90
b. Minor Thoroughfare	70
c. Local Street	60*
d. Cul-de-Sac	Variable**

The subdivider will only be required to dedicate a maximum of 100 ft of right-of-way. In cases where over 100 ft of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 ft. In all cases in which right-of-way is sought for a fully controlled access facility, the subdivider

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* The desirable minimum right-of-way (ROW) is 60 feet. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

** The ROW dimension will depend on radius used for vehicular turn around. Distance form edge of pavement of turn around to ROW should not be less than distance form edge of pavement to ROW on street approaching turn around.

will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 60 ft in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider, provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths: Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:
   1. Local Residential
      Curb and Gutter section: 26 ft, face to face of curb
      Shoulder section: 20 ft to edge of pavement, 4 ft for shoulders
   2. Residential Collector
      Curb and Gutter section: 34 ft, face to face of curb
      Shoulder section: 20 ft to edge of pavement, 6 ft for shoulders

C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System of Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.
   1. Design Speed: The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets shall be:

Table 12. Design Speeds

Facility Type	Design Speed (km/h)		
	Desirable	Minimum Level	Minimum Rolling
RURAL			
• Minor Collector Roads (ADT > 2000)	60	50	40
• Local Roads including Residential Collectors & Local Residential (ADT > 4000)	50	50*	40*
URBAN			
• Major Thoroughfare other than Freeways or Expressways	60	50	40
• Minor Thoroughfares	40	30	30
• Local Streets	30	30**	20**

* Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed.

** Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

2. Maximum and Minimum Grades
   a. The maximum grades in percent shall be:

Table 13. Maximum Vertical Grade (English)

Facility Type	Design Speed (mph)	Maximum % Grade		
		Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local roads including	20	--	11	16
Residential Collectors and	30	7	10	14
Local Residential Streets*	40	7	9	12
	50	6	8	10
	60	5	6	--
URBAN				
Major Thoroughfares other	30	8	9	11
than Freeways or	40	7	8	10
Expressways	50	6	7	9
	60	5	6	8
Minor Thoroughfares*	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets*	20	--	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	--

* For streets and roads with projected annual average daily traffic less than 250 of short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3).

   b. Minimum grade should not be less than 0.5%.
   c. Grades for 30 meters (100 feet) each way from intersections (measured from edge of pavement) should not exceed 5%.
3. Minimum Sight Distance: In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that

connect each change in grade shall be provided and calculated using the following parameters:

Table 14. Sight Distance				
Design Speed (mph)	**30**	**40**	**50**	**60**
Stopping Sight Distance:				
Minimum (feet)	200	275	400	525
Desirable (feet)	200	325	475	650
Minimum K* Value for:				
Crest curve	30	60	110	190
Sag curve	40	60	90	120
Passing Sight Distance:				
Minimum Passing Distance for two lanes (feet)	1,100	1,500	1,800	2,100

(General practice call for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)
(Reference NCDOT Roadway Design Manual page 1-12 T-1)

* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with A Policy of Geometric Design of Highways and Streets, 1990.

4. The "Superelevation Table" shown below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevations (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

Table 15. Superelevation Table			
Design Speed (mph)	**Maximum e***	**Minimum Radius (ft)**	**Maximum Degree of Curve**
30	0.04	302	19 00'
40	0.04	573	10 00'
50	0.04	955	6 00'
60	0.04	1,637	3 45'
30	0.06	273	21 00'
40	0.06	521	11 15'
50	0.06	955	6 45'
60	0.06	1,432	4 15'
30	0.08	260	22 45'
40	0.08	477	12 15'
50	0.08	819	7 30'
60	0.08	1,146	4 45'

* e = rate of roadway superelevation, foot per foot (Reference NCDOT Roadway Design Manual page 1-12 T-6 through T-8)

D. Intersections

1. Streets shall be laid out so as to intersection as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five degrees (65%).
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersection streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey center lines.

E. Cul-de-Sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance form the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance form the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
2. The width of an alley shall be at least 20 feet.
3. Dead end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the dead end as may be required by the Planning Board.

G. Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets to Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheelchair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provided wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Decks

1. The clear roadway widths for new and reconstructed bridges serving tow-lane, two-way traffic should be as follows:
   a. Shoulder section approach
      i. Design year ADT < 800: Minimum 28 ft width face to face of parapets, rails, or pavement width, plus 10 ft, whichever is greater.
      ii. Design year ADT between 800-2000: Minimum 34 ft width face to face of parapets, rails, or pavement width, plus 12 ft, whichever is greater.
      iii. Design year ADT > 2000: Minimum width of 40 ft, desirable width of 44 ft width face to face of parapets or rails.
   b. Curb and gutter approach
      i. Design year ADT < 800: Minimum 24 ft face to face of curbs.
      ii. Design year ADT > 800: Width of approach pavement measured face to face of curbs.

      Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 1.5 ft, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having four or more lanes serving undivided tow-way traffic should be as follows:
   a. Shoulder section approach: Width of approach pavement plus width of useable shoulders on the approach left and right. (Shoulder width 8 ft minimum, 10 ft desirable.)
   b. Curb and gutter approach: Width of approach pavement measured face to face of curbs.

APPENDIX D

Typical Thoroughfare Cross-Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfare are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in **Figure 14**. These cross sections are typical for facilities on new location, where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels, and available right-of-way and are tabulated in **Appendix E**.

Cross sections "A" and "L" are typical for controlled access freeways. The 46-foot grassed median is the minimum desirable median width, but may vary depending upon design considerations. Right-of-way requirements would typically vary upward from 228 feet, depending upon cut and fill requirements.

Cross section "B," seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

Cross sections "C," five lane roadways, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "D," "E," and "M" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16-foot median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

Cross section "F" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria are met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which have high volumes of left turning traffic and provide access to adjacent development typically require cross section "H." Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfare where parking on both sides is needed as a result of more intense development.

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 feet should be required. In some instances, local ordinances may not allow the full 100 feet. In those cases, 70 feet should be preserved with the understanding that the full 100 feet will be preserved by use of building setbacks and future street line ordinances.

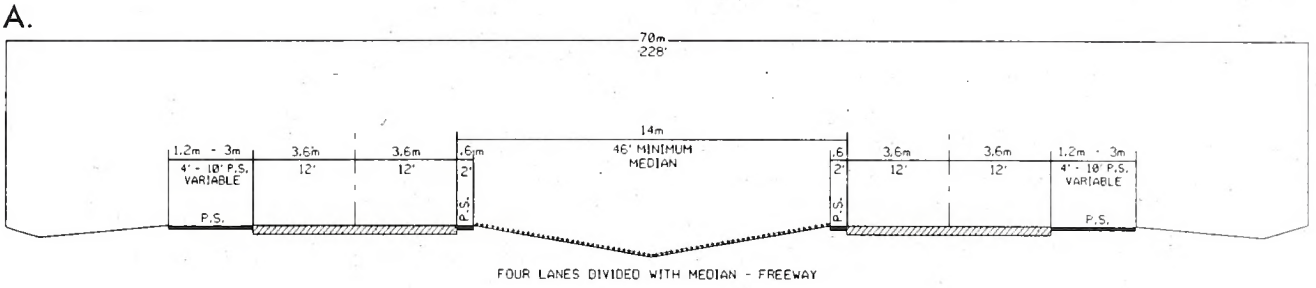
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The rights-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may necessitate either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N," "O," and "P" are typically used to accommodate bicycle travel.

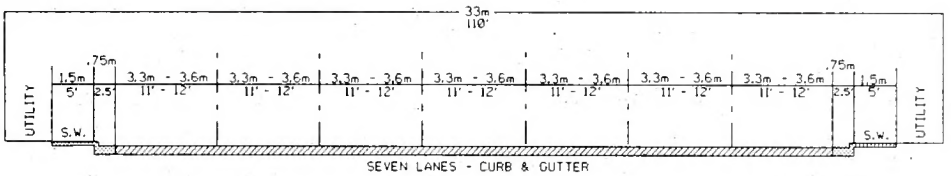
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



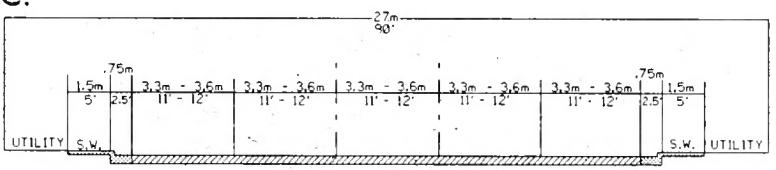
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



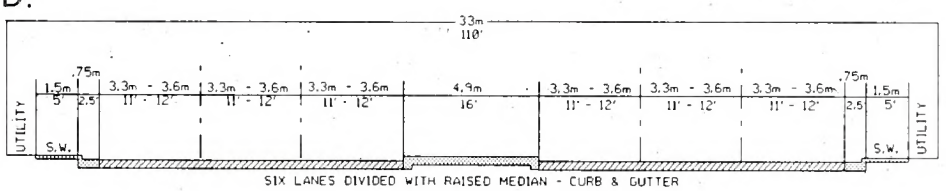
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

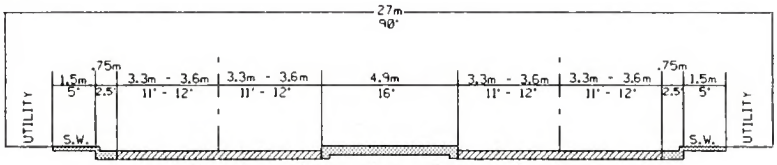


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE 13

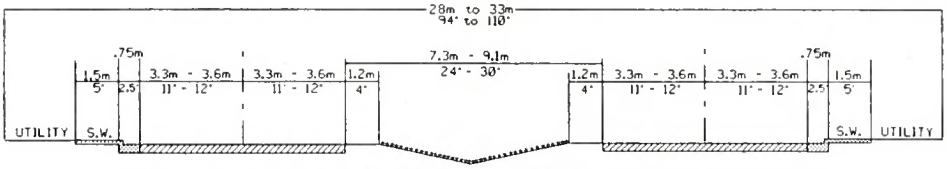
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



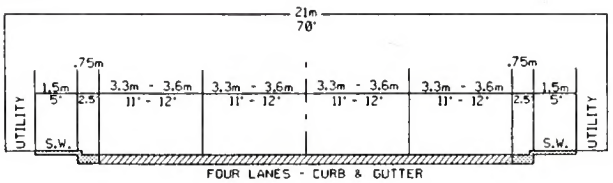
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



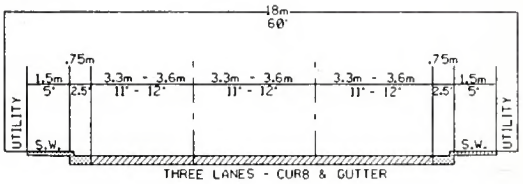
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



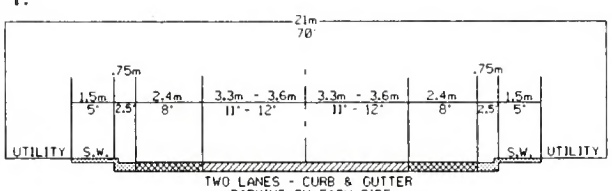
FOUR LANES - CURB & GUTTER

H.



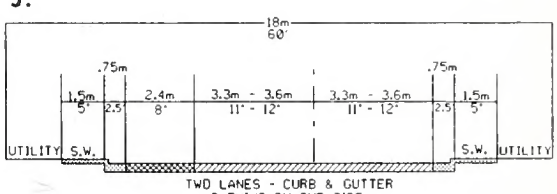
THREE LANES - CURB & GUTTER

I.



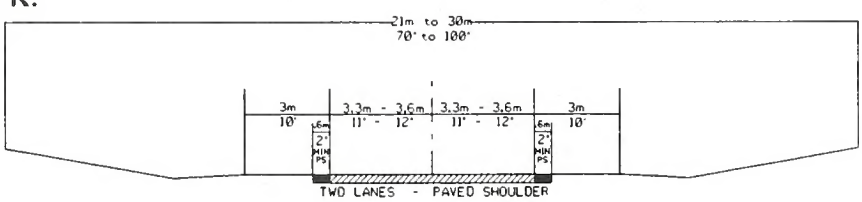
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

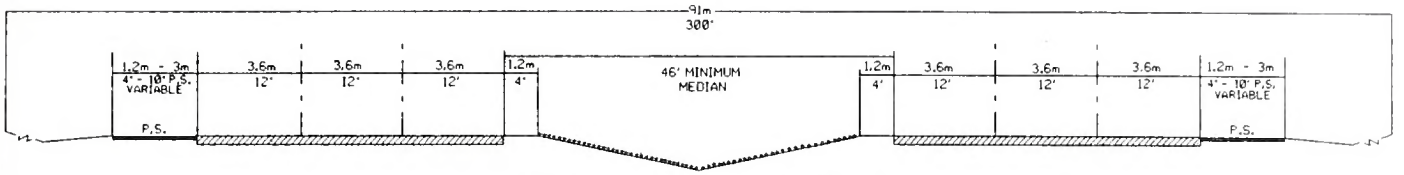
K.



TWO LANES - PAVED SHOULDER

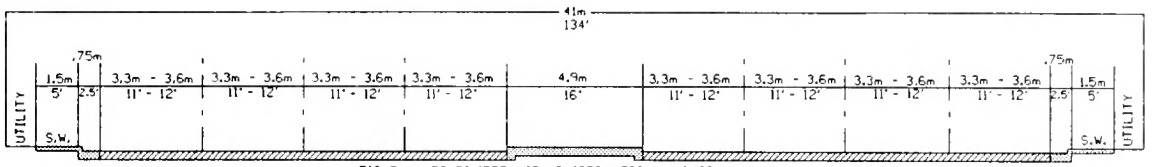
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

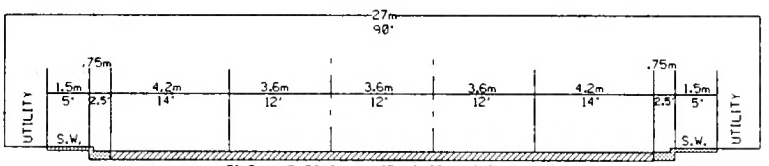
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

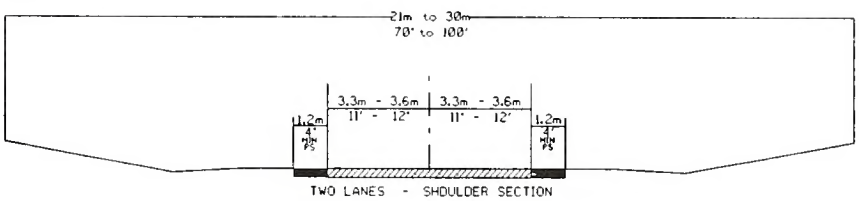
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



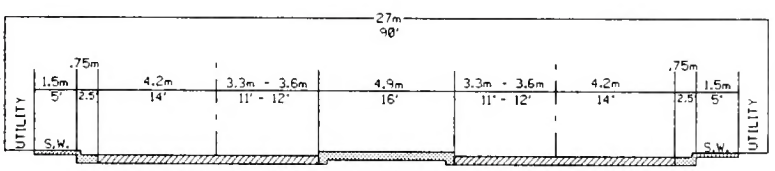
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

APPENDIX E

Thoroughfare Plan Street Tabulations & Recommendations

Facility & Segment			♦♦EXISTING ROADWAY SYSTEM♦♦					♦♦PROPOSED ROADWAY SYSTEM♦♦			
From	To	Distance (mi)	Roadway Cross-Section (ft)	lanes	ROW (ft)	Capacity (vpd)	AADT (vpd)	Capacity (vpd)	AADT (vpd)	Cross-Section	ROW (ft)
Industrial Park Road (SR 1358)											
US 64	Industrial Park Road (SR 1366)	0.28	24	2	N/A	13500	150	13500	600	ADQ	ADQ
Industrial Park Road (SR 1366)											
Mackey's Road (SR 1300)	0.35 miles south	0.35	20	2	N/A	11500	150	11500	400	ADQ	ADQ
0.35 miles south	Industrial Park Road (SR 1366)	0.25	24	2	N/A	13500	150	13500	400	ADQ	ADQ
Long Ridge Road (SR 1100)											
SPAB	US 64	0.80	20	2	N/A	11500	1900	11500	4300	ADQ	ADQ
Mackey's Road (SR 1300)											
NC 308	Main Street (SR 1325)	2.02	20	2	N/A	9500	2300	9500	5900	ADQ	ADQ
Main Street (SR 1325)											
US 64	0.08 miles west	0.08	24	2	N/A	13500	1500	13500	2900	ADQ	ADQ
0.08 miles west	Rankin Street (SR 1342)	1.06	24	2	N/A	12000	5000	12000	7200	ADQ	ADQ
Rankin Street (SR 1342)	Washington Street (SR 1357)	0.52	24	2	N/A	12000	3600	12000	3900	ADQ	ADQ
Washington Street (SR 1357)	0.17 miles west	0.17	50	2	N/A	12000	2600	12000	3500	ADQ	ADQ
0.17 miles west	0.21 miles west	0.21	24	2	N/A	12000	1800	12000	2500	ADQ	ADQ
0.21 miles west	Martin County Line	0.47	20	2	N/A	9500	1700	9500	1800	ADQ	ADQ
Monroe Street											
US 64	Main Street (SR 1325)	0.60	24	2	N/A	12000	3900	12000	5000	ADQ	ADQ
Morratuck Road (SR 1106)											
NC 32-45	Long Ridge Road (SR 1100)	2.10	20	2	60.0	11500	700	11500	2700	ADQ	ADQ
NC 32											
NC 45	SCL Plymouth	3.96	20	2	60.0	11500	1400	11500	7000	ADQ	ADQ
SCL Plymouth	0.08 miles north	0.08	22	2	60.0	12500	1400	12500	8000	ADQ	ADQ
0.08 miles north	US 64	0.61	22	2	60.0	10500	1400	10500	9100	ADQ	ADQ
NC 32-45											
SPAB	NC 45	1.10	20	2	60.0	11500	3600	11500	6300	ADQ	ADQ
NC 45											
NC 32	SCL Plymouth	0.88	20	2	100.0	11500	1100	11500	2600	ADQ	ADQ
SCL Plymouth	WCL Plymouth	0.23	20	2	100.0	11500	1100	11500	3500	ADQ	ADQ
WCL Plymouth	2.26 miles west	2.26	20	2	100.0	11500	1600	11500	4200	ADQ	ADQ
2.26 miles west	US 64	0.04	40	2	100.0	13500	1600	13500	3400	ADQ	ADQ
NC 149											
US 64	SCL Plymouth	0.95	24	2	100.0	13500	5100	13500	11000	ADQ	ADQ

Facility & Segment		♦♦EXISTING ROADWAY SYSTEM♦♦						♦♦PROPOSED ROADWAY SYSTEM♦♦			
From	To	Distance (mi)	Roadway Cross-Section (ft)	lanes	ROW (ft)	Capacity (vpd)	AADT (vpd)	Capacity (vpd)	AADT (vpd)	Cross-Section	ROW (ft)
Rankin Street (SR 1342)											
US 64	Main Street (SR 1325)	0.60	24	2	60.0	13500	2700	13500	4200	ADQ	ADQ
NC 45	US 64	2.75	24	2	N/A	N/A	N/A	13500	8400	K	70
Reese Road (SR 1109)											
NC 45	Reese Road (SR 1110)	0.85	18	2	60.0	9500	400	9500	500	ADQ	ADQ
Reese Road (SR 1110)											
Reese Road (SR 1109)	US 64	0.25	18	2	60.0	9500	400	9500	1000	ADQ	ADQ
Roosevelt Avenue (SR 1108)											
SCL Plymouth	0.6 miles north	0.60	18	2	N/A	8500	600	8500	1000	ADQ	ADQ
0.6 miles north	NC 32	0.47	18	2	N/A	7500	600	7500	1000	ADQ	ADQ
Roper Road (SR 1114)											
NC 45	0.41 miles west	0.41	20	2	60.0	10500	2000	10500	2100	ADQ	ADQ
0.41 miles west	NC 32	0.33	20	2	60.0	9500	250	9500	900	ADQ	ADQ
Third Street (SR 1335)											
Wilson Street (SR 1335)	Washington Street (SR 1357)	0.25	24	2	N/A	12000	1540	12000	3200	ADQ	ADQ
Third Street											
Washington Street (SR 1357)	Rankin Street (SR 1342)	0.50	20	2	N/A	9500	1540	9500	1600	ADQ	ADQ
US 64											
Martin County	0.23 miles east	0.23	48	4	160.0	29000	8800	29000	18400	ADQ	ADQ
.23 miles east	WCL Plymouth	1.89	64	4	100.0	29000	8400	29000	22000	ADQ	ADQ
WCL Plymouth	ECL Plymouth	2.56	64	4	100.0	29000	14000	29000	23000	ADQ	ADQ
ECL Plymouth	NC 45	2.52	64	4	100.0	29000	9500	29000	17000	ADQ	ADQ
Washington Street (SR 1357)											
US 64	Main Street (SR 1325)	0.61	36	2	N/A	12000	6000	12000	8000	ADQ	ADQ
West Avenue											
Roosevelt Avenue	US 64	0.40	20	2	N/A	10500	2400	10500	4800	ADQ	ADQ
US 64	Wilson Street (SR 1335)	0.23	20	2	N/A	10500	1200	10500	3000	ADQ	ADQ
Wilson Street (SR 1335)											
US 64	SCL Plymouth	0.59	24	2	N/A	13500	2000	13500	4200	ADQ	ADQ
SCL Plymouth	Third Street (SR 1335)	1.38	24	2	N/A	12000	3100	12000	5100	ADQ	ADQ

APPENDIX F

Definitions of Environmental Status Codes

Definitions of Environmental Status Codes: North Carolina Natural Heritage Program[1]

North Carolina Status[2]		Description
E	**Endangered**	"Any species or higher taxon of plant whose continued existence as a viable component of the States flora is determined to be in jeopardy" (GS 19B 106: 202.12). (Endangered species may not be removed from the wild except when a permit is obtained for research, propagation, or rescue which will enhance the survival of the species).
T	**Threatened**	"Any resident species of plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (GS 19B 106: 202.12). (Regulations are the same as for Endangered Species).
SC	**Special Concern**	"Any species of plant in North Carolina which requires monitoring but which may be collected and sold under regulations adopted under the provisions of [the Plant Protection and Conservation Act]" (GS 19B 106:202.12). (Special Concern species that are not also listed as Endangered or Threatened may be collected from the wild and sold under specific regulations. Propagated material only of Special Concern species that are also listed as Endangered or Threatened may be traded or sold under specific regulations.)
C	**Candidate**	Species which are very rare in North Carolina, generally with 1-20 populations in the state, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are also either rare throughout their ranges (fewer than 100 populations total) or disjunct in North Carolina from a main range in a different part of the country or world. Also included are species which may have 20-50 populations in North Carolina, but fewer than 50 populations worldwide. These are species which have the preponderance of their distribution in North Carolina and whose fate depends largely on their conservation here. Also included are many species known to have once occurred in North Carolina but with no known extant occurrences in the state (historical or extirpated species); if these species are relocated in the state, they are likely to be listed as Endangered or Threatened. If present land use trends continue, candidate species are likely to merit listing as Endangered or Threatened.
SR	**Significantly Rare**	Species which are very rare in North Carolina, generally substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease). These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina. Also included are some species with 20-100 populations in North Carolina, if they also have only 50-100 populations rangewide and are declining.

[1] The information on which this list is based comes from a variety of sources, including field surveys, museums, herbaria, scientific literature, and personal communications. This list, which was compiled on Novmber 21, 2000, is dynamic, with new records continually being added and old records being revised as new information is received. As a result, the enclosed list cannot be considered a definitive record of natural heritage elements present in a given county or quad and should not be used as a substitute for field surveys.

[2] Plant statuses are determined by the Plant Conservation Program (NC Department of Agriculture), the Natural Heritage Program (NC Department of Environment and Natural Resources), and the North Carolina Plant Protection and Conservation Act of 1979. Animal statuses are determined by the *publication Endangered Wildlife of North Carolina*, March 16, 1992, and the Nongame and Endangered Wildlife Program (NC Department of Environment and Natural Resources).

W	**Watch List**	Any other species believed to be rare and of conservation concern in the state but warranting active monitoring at this time.
P	**Proposed**	A species which has been formally proposed for listing as Endangered, Threatened, or Special Concern, but has not yet completed the legally mandated listing process.

Federal Status[3]		Description
LE	**Endangered**	A taxon "which is in danger of extinction throughout all or a significant portion of its range" (Endangered Species Act, Section 3).
LT	**Threatened**	A taxon "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act, Section 3).
C	**Candidate**	A taxon under consideration for which there is sufficient information to support listing. This category was formerly designated as a Candidate 1 (C1) species.
LEXN		Endangered, nonessential experimental population. The Endangered Species Act permits the reintroductions of endangered animals as "nonessential experimental" populations. Such populations, considered nonessential to the survival of the species, are managed with fewer restrictions than populations listed as endangered.
FSC		Federal "Species of Concern" (also called "Species at Risk"). Formerly defined as a taxon under consideration for which there is insufficient information to support listing; formerly designated as a Candidate 2 (C2) species. Currently, the US Fish and Wildlife Service does not recognize this as an official designation.
T(S/A)		Threatened due to Similarity of Appearance. The Endangered Species Act authorizes the treatment of a species (subspecies or population segment) as threatened even though it is not otherwise listed as threatened if: (a) the species so closely resembles in appearance a threatened species that enforcement personnel would have substantial difficulty in differentiating between the listed and unlisted species; (b) the effect of this substantial difficulty is an additional threat to a threatened species; and (c) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of the Act. The American Alligator has this designation due to similarity of appearance to other rare crocodilians.
PE	**Proposed**	Species has been proposed for listing as endangered.

[3] These statuses are designated by the US Fish and Wildlife Service. Federally listed Endangered and Threatened species are protected under the provisions of the Endangered Species Act of 1973, as amended through the 100th Congress. Unless otherwise noted, definitions are taken from the Federal Register, Vol. 56, No. 225, November 21, 1991 (50 CFR Part 17).

APPENDIX G

Resources & Contacts

RESOURCES & CONTACTS

North Carolina Department of Transportation

Customer Service Office
1-877-DOT4YOU
(1-877-368-4968)

Secretary of Transportation
1501 Mail Service Center
Raleigh, NC 27699-1501
(919) 733-2520

Board of Transportation Member
Contact information for the current Board of Transportation Member may be accessed from the NCDOT homepage on the worldwide web (http://www.dot.state.nc.us/board) or by calling 1-877-DOT4YOU.

Highway Division 1

- **Division Engineer**
  Contact the Division Engineer with general questions concerning NCDOT activities within Division 1; information on Small Urban Funds.
  P.O. Box 850
  Edenton, NC 27932
  (252) 482-7977

- **Division Construction Engineer**
  Contact the Division Construction Engineer for information concerning major roadway improvements under construction.
  P.O. Box 850
  Edenton, NC 27932
  (252) 482-7977

- **Division Traffic Engineer**
  Contact the Division Traffic Engineer for information concerning high-collision locations.
  P.O. Box 850
  Edenton, NC 27932
  (252) 482-7977

- **District Engineer**
  Contact the District Engineer for information regarding Driveway Permits, Right of Way Encroachments, and Development Reviews.
  P.O. Box 928
  Plymouth, NC 27962
  (252) 793-4568

- **County Maintenance Engineer**
  Contact the County Maintenance Engineer regarding any maintenance activities, such as drainage.
  19204 US Hwy. 64 East
  Creswell, NC 27928
  (252) 797-4598

Centralized Personnel

- **Statewide Planning Branch**
  Contact the Statewide Planning Branch with long-range planning questions.
  1554 Mail Service Center
  Raleigh, NC 27699-1554
  (919) 733-4705

- **Secondary Roads Office**
  Contact the Secondary Roads Officer for information regarding the Industrial Access Funds Program.
  P.O. Box 25201
  Raleigh, NC 27699
  (919) 733-3520

- **Program Development Branch**
  Contact the Program Development Branch for information concerning Roadway Official Corridor Maps and the Transportation Improvement Program (TIP).
  1534 Mail Service Center
  Raleigh, NC 27699-1534
  (919) 733-2039

- **Project Development & Environmental Branch**
  Contact PDEA for information on environmental studies for projects that are included in the TIP.
  1548 Mail Service Center
  Raleigh, NC 27699-1548
  (919) 733-3141

- **Highway Design Branch**
  Contact the Highway Design Branch for information regarding alignments for projects that are included in the TIP.
  1584 Mail Service Center
  Raleigh, 27699-1584
  (919) 250-4001

- **Other departments**
  Contact information for other departments within the NCDOT not listed here are available at the NCDOT homepage on the worldwide web (http://www.dot.state.nc.us/board) or by calling 1-877-DOT4YOU.

Other State Government Offices

Division of Community Assistance

Contact the Division of Community Assistance for information regarding the Community Planning Program.

Washington Regional Office
P.O. Box 850
Washington, NC 27889
(252) 974-1308
http://www.dca.commerce.state.nc.us